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DEVELOPMENT OF A LIBRARY SYSTEM
WITH A WEB-INTERFACE

GRADUATE QUALIFICATION WORK
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INTRODUCTION

Topicality

The internet was invented in 1969 by ARPANET. The World Wide Web was invented in 1989. The first website was launched in 1990. However, during all of that, most people did not know about the internet. The internet become well known with the launch of Windows 95 in 1995, but most people did not get it in their homes until 1997 and 1998. In fact, the percent of households with internet access only reached 50 percent in 2000. Some people did not see any usefulness in the internet or simply did not want to pay the high prices. Also in the earliest days of the internet, there was no YouTube, Facebook, or even Google. Also, keep in mind that home computers did not become popular until around 1995. Windows 95 was the first highly anticipated product before then, many products just faded into popularity. Today, nearly every product is launched with a bang.

The internet has grown as popular as it is easy to use and you can find virtually every piece of information on the internet just a click away. People of every age from children to the old people understand how internet works which has found to be the main reason of its so grown popularity. It connects us to people all over the world and provides endless information and entertainment [8].

In the 1990s, a cycle of transition began in library automation development and implementation, reflecting the evolution of the information industry at the time. The majority of research and academic libraries moved towards automating access to their collections, alas not in a homogeneous manner. However, the evolution of Web 2.0, the convenience of the relevancy ranked search results promulgated by Google, and the convergence of media industries has pushed libraries and LMS vendors to redesign the LMS. Library websites now offer access to unconnected silos: e-journals, the catalog, databases, subject guides, all accessed separately. Moreover, e-books have entered the library stream, while the dominance of print collections is gradually receding without, of course, having their importance diminished, especially for research/academic libraries [7].

A Library Management System (LMS) gives access to and manages the resources in your library. A well-chosen system will increase your library's efficiency, save valuable administration time, lead to a better educational experience for pupils and help develop independent learning [9].

The Library Management System is an application for assisting a librarian in managing a book library. The system would provide basic set of features to add/update members, add/update books, and manage check in specifications for the systems based on the client's statement of need.

Library management system is a typical management Information system (MIS), its Development include the establishment and maintenance of back-end database and front-end application development aspects. For the former require the establishment of data consistency and integrity of the strong data security and good libraries. As for the latter requires the application fully functional, easy to use and so on [5].

This project of "Library Management" will gives us the complete information about the library. We can enter the record of new books and retrieve the details of books available in the library. We can issue the books to the users and maintain their records and can check how many books are issued and stock available in the library. In this project, we can maintain the late fine of users who returns the issued books after the due date.

Research goal and objectives

The goal of the research is the Development of a Library System with a Web-Interface.

For the reaching this goal we must solve the following objectives:

1) to study the modern tools of web sites developing and make the comparative analysis of the content management systems for web-development;

2) to study the analogical library management systems with web-interface and declare their peculiarities, advantages and disadvantages;

3) to develop the structure of the required database for library management system;

4) to design the web-application;

5) to describe the mathematical model of penalty calculations for the library management system;

6) to implement the library management system with a web-interface;

7) to test the system.

The practical significance

This project is useful to help any type of users whether students or regular readers as well as staff of library to maintain the library in the best way possible and reduce the human efforts.

This project can be useful because it contains features to convenient work with books for usual people and library's managers:

1) secure access for the private data about the users, including the individual identification at the site for all users;

2) saving the time and efforts while working at site;

3) ensuring data integrity about books;

4) check the numbers of books in each categories;

5) uploading books with the details on the system;

6) easily for the users to check the books and the availability to borrow;

7) easily process to calculation a borrowed and returned books recorded in the system;

8) easily for the user to check his borrowed books with the returned date;

9) unlimited number of users;

10) ability for the following development of the site.

Structure of the thesis

The thesis consists of four chapters, introduction, conclusion and reference list.

In the first chapter, the problem statement is given as well as the overview and comparative analysis of popular content management systems for web-development is done. Additionally, we describe the chosen development tools here, and give analysis of the analogical sites.

In chapter two, there is a description of functional requirements, use case diagram, database scheme and the design of the application interfaces.

In chapter three, we show the architecture of the developed system, several fragments of PHP-code for implementing the basic functionality of the system and the algorithm of the penalty calculation and its' implementation in the web-application.

Chapter Four is devoted to the testing of the application.

The thesis has 68 pages; the list of references contains 22 resources.

1. THE ANALYSIS OF THE SUBJECT AREA

1.1. The problem statement

Modern libraries are complex systems that consist of many procedures and functions. Traditionally, these functions (subsystems) have included acquisition of materials, cataloging and classification, circulation and interlibrary loan, serials management, and reference services. The most important function, however, has been the provision of service to the users. For centuries, librarians have managed warehouses of documents by acquiring, cataloging, and classifying books, journals, and other materials, and circulating them to their clients. Computer and telecommunication technologies have empowered the new breed of information professionals to select, organize, retrieve, and transfer the actual information effectively and efficiently to the users.

Historically, the most labor-intensive operation of a library has been circulation, the main goal of which is to retain a record for each item that is borrowed from the library. This transaction record usually contains information about the material (e.g., call number, title, and author), as well as information about the borrower (e.g., name, address, telephone numbers). The record also includes two other important items: the borrowing date and the due date. Up until the mid-1970s, the library staff, or in some cases the user, would enter the circulation transaction information on a special card for each borrowed item and then file the card in a pre-specified sequence (e.g., by call number, title, or date due back to the library). When the book was returned, the appropriate circulation card would be pulled from the file, and the book would be returned to the shelves. Maintaining the circulation file, however, was a time-consuming task. Every day, the file would have to be updated, which involved merging and sorting the new transaction cards with the master file, locating overdue books, and identifying items that were requested by other users. In addition, individual overdue notices had to be written and sent, fines had to be calculated, and library users who had outstanding fines had to be identified. The terms "electronic library," "e-library," "virtual library," and "digital library" have been used interchangeably to describe a new

phenomenon the development of digital information warehouses. The digital library, encompassing many concepts, was best defined by Christine Borgman as "(1) a service; (2) an architecture; (3) a set of information resources, databases consisting of text, numbers, graphics, sound, video, etc., and (4) a set of tools and capabilities to locate, retrieve and use the information resources available. Libraries have automated their subsystems to provide better service to their users. At the same time, advances in computer and telecommunication technologies, new standards for storage and retrieval of documents, and the World Wide Web have dramatically changed the functions performed by librarians. Automating libraries now signifies the transfer of digital information, regardless of the medium, shape, size, or form, from the producer to the consumer. Library automation has been transformed to information automation [10].

I will create a library management system. It is a project, which aims in developing a computerized system to maintain the daily work of library.

A library needs to store information pertaining to its users (customers), its staff and must keep the status of each book: its location, description, status, and the cost for loses and late returns. Customers will provide their name, and contact details when signing up in a library.

This project will be available for the web user. The system will be developed on the open source platform, so we can get an access to the system from anywhere and anytime and navigate easily. This system will help a librarian to manage a library in an easy way and to avoid all types of human mistakes. In addition, a client can easily login and get an access to the books, according to their requirement.

The project's main aim is to build a management system like a website which:

- can create a computerized management system for a library;
- has the capability to issue (borrow) books;
- has the capability to register returned books;
- has an administrator account;

- has the capability to search availability of books;

- can manage users through administrator account;

- can check the books that users have issued;

- keeps the databases correct and up-to-date;

- can store all the books and user data in a proper manner.

Overall, this project is developed to help the user as well as a staff of a library to maintain the library in the best possible way and to reduce the human efforts.

1.2. Comparative analysis of the content management systems for web-development

A Content management system (CMS) is a software system that provides website authoring, collaboration, and administration tools designed to allow users to create and manage website content. This comparison describes three CMSs: Joomla, WordPress and Drupal.

Table 1 shows the comparison in different function between Joomla, WordPress and Drupal.

Table 1. Comparative analysis of the CMSs table

No.	Function	Joomla	Wordpress	Drupal
1.	About	Great for e-commerce or social networking websites, but requires a basic understanding of technical skills. Joomla offers a platform between the developer-oriented, extensive capabilities of Drupal and the user-friendly but more complex site development options that WordPress offers [22].	Best choice for beginners because of its ease-of-use, it works especially well for small to medium sized websites, blogs and smaller e-commerce stores. WordPress began as an innovative, easy-to-use blogging platform. This CMS is also widely used for other website formats also [22].	The most difficult, but also the most powerful. It requires a familiar understanding of HTML, CSS and PHP. Drupal is a powerful, developer-friendly tool for building complex sites. Like most powerful tools, it requires some expertise and experience to operate [22].
2.	Ease of use	Joomla is less complex than Drupal but more complex than Wordpress. It has a relatively uncomplicated installation and setup. With a relatively small investment of effort into understanding Joomla's structure and terminology [19].	Technical experience is not necessary; it's intuitive and easy to get a simple site set up quickly. It's easy to paste text from a Microsoft Word document into a WordPress site, but not into Joomla and Drupal sites [19].	Drupal requires the most technical expertise of the three CMSs. However, it also is capable of producing the most advanced sites [19].

No.	Func-tion	Joomla	Wordpress	Drupal
3.	supporting database	Joomla supports MySQL and other database management systems like SQLite and PostreSQL [22].	WordPress exclusively supports only MySQL, but it can work with Maria DB also [22].	Drupal support MySQL and other database management systems like Oracle, Microsoft SQL Server, etc. [22].
4.	Speed	If not tweaked properly it can consume resources rather quickly [22].	Can handle traffic well but requires better hosting plans as the traffic grows [22].	Typically loads more quickly, and has faster response times than websites made with WordPress or Joomla [22].
5.	Cost	Joomla is free option to use on your own web servers. However similar to Drupal, there is no option to have it hosted for free like WordPress offers [22].	WordPress is absolutely, no-strings-attached free to use. And building on the last point, there are easily tens of thousands of free plug-ins and themes available to choose from. This is perfect for most beginners putting together their first site because it keeps costs down [22].	Like both WordPress and Joomla, You can download the Drupal software for free, and install it on your own hosting server [22].
6.	Customizable	Joomla comes with templates and extensions. There are great extensions to do just about anything from creating an ecommerce store to managing email [19].	WordPress has significantly more plug-ins, themes and other customizations available than any other CMS. Because of its widespread popularity, more third-party designers and developers create free (or relatively inexpensive) new WordPress tools [19].	Drupal is easy to customize with many widely available plug-ins, themes and other configurable options to choose from. You can also edit the root files directly, perfect for those developers who need to make more significant changes [19].
7.	Community Support	Joomla offers a great help portal for asking questions and getting technical support. It's not fast or extensive as WordPress' community-based support pages, but is definitely quicker (and cheaper) than Drupal's technical support options [22].	If you do experience issues or have questions about your new WordPress site, you can easily tap into the *millions of people* already using and supporting it. Their support forum includes helpful contributors that can answer any question you might have, within minutes [22].	Support is available at drupal.org, as well as Stack Exchange and many other sites [22].
8.	Year of	Joomla was released in 2005 started from Mambo [17].	WordPress was released in 2005 by Matt Mullenwegg [18].	Drupal was released in 2001 by Dries Buytaert [22].
9.	Current support	Yes	Yes	Yes
10.	Mobile Friendly	Yes	Yes	Yes

No.	Function	Joomla	Wordpress	Drupal
11.	Security	They actively respond to any security vulnerability and are very quick to patch it up. However, maintaining a website and installing updates is still up to the user. There are extensions available to back up Joomla site. Also can strengthen Joomla site's security by following the best practices [22].	WordPress is built on a very secure code, and it responds to security vulnerability very quickly. WordPress also has an auto-update mechanism which allows WordPress websites to automatically update when there is a new security patch. There is also a built-in mechanism to show updates for WordPress themes and plugins. This allows themes and plugin developers to rapidly respond to any security vulnerability [22].	Drupal takes a very serious approach to security. They publish security vulnerabilities on their own site as they are discovered and patched [22].

Many of websites today are powered by easy to use content management systems (CMS) that allow making changes and controlling the website in simple way.

All three WordPress, Joomla and Drupal offer great features, tons of customizations, ease-of-use, and strong security. WordPress is considered the best choice for beginners because of its ease-of-use, it works especially well for small to medium sized websites and smaller e-commerce stores. Drupal is the most difficult and complex to use. Joomla is somewhere between WordPress and Drupal, it is great for e-commerce or social networking websites, but requires a basic understanding of technical skills that led to choose it for build in the website. PHP is a server side scripting language that is embedded in HTML. It is used to manage dynamic content, databases, session tracking, even build entire web sites[20].

1.3. The comparative analysis of existing e-libraries

The market for e-libraries and digital content is continually evolving and adapting, while simultaneously becoming increasingly global in terms of its interdependence and reach.

These are some e-libraries business models review: General Secretary of the Central Library [1]. Fig. 1 shows the main page of General Secretary of the Central Library.

Fig. 1. Home page of General Secretary of the Central Library

The general secretariat of the central library in Baghdad University considers from the first major universities' library in Iraq.

The library keeps on providing scientific search service for users and works side by side with other large libraries in Iraq like National Library, General Awqaf Library, Iraqi Museum Library, Library of College of Art, Library of Medicine College in Baghdad University.

The Iraq Virtual Science Library - IVSL provides free, full-text access to thousands of scientific journals to which the Ministry of Higher Education and Scientific Research is subscribing to from major publishers as well as a large collection of on-line educational materials. IVSL is powered by the discovery system LibHub provided by SemperTool, a company specialized in building digital library products [12].

Fig. 2 shows the Home page of IraqVirtual Science Library.

The Alexandrina library seeks to restore the spirit of openness and research for the reader. Its' affiliated libraries are the Francophone Library, the Depository Library and the Library of Maps [11].

Fig. 3 shows the Home page of Alexandria Library.
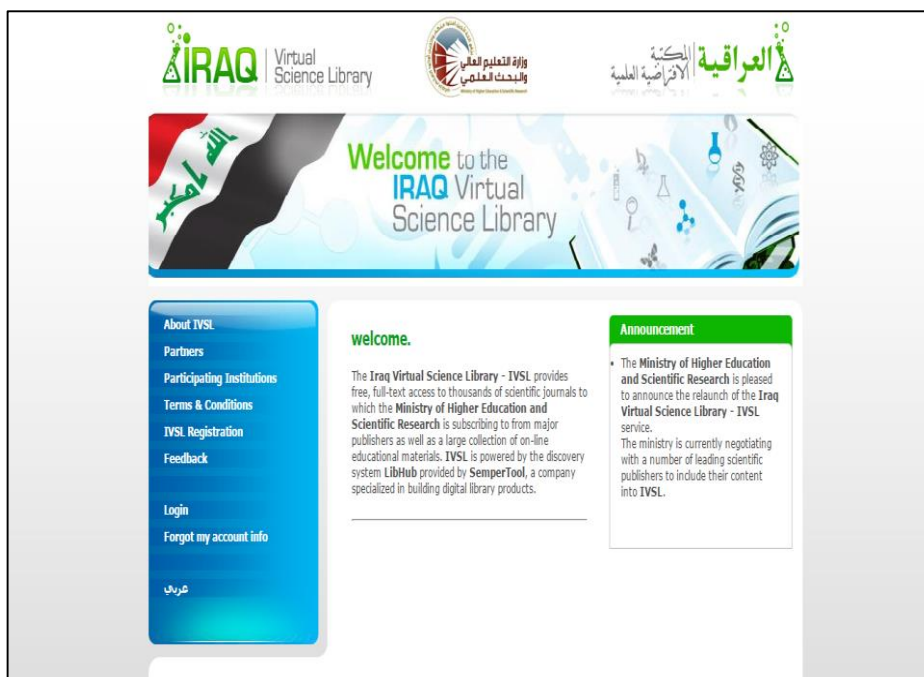
Fig. 2. Home page of Iraq Virtual Science Library
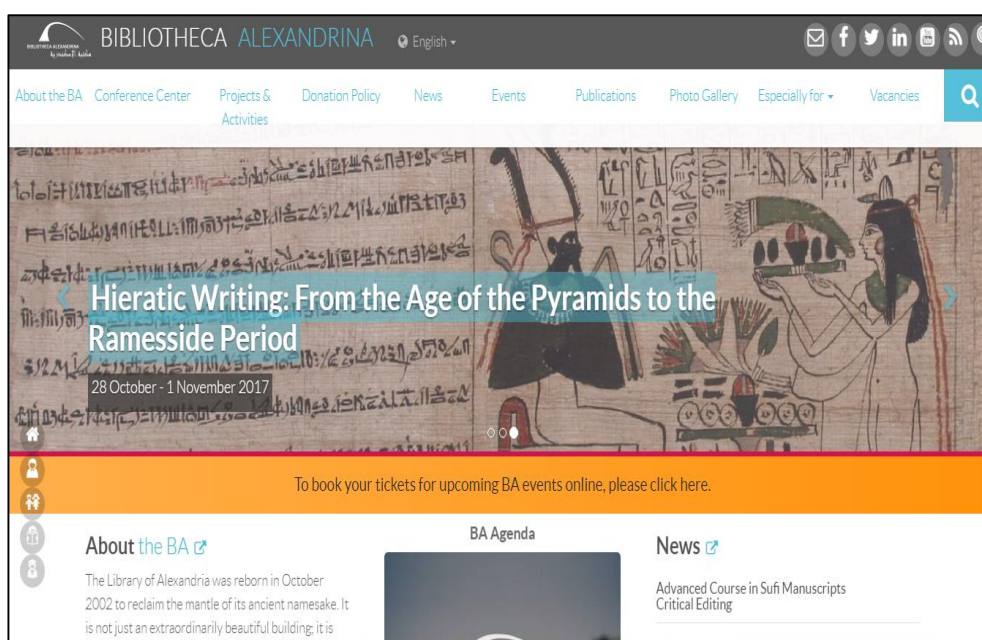
Fig. 3. Home page of Alexandria Library

The library has comprehensive collections of printed and electronic books. The library also has a number of scientific databases that serve all disciplines and programs at Qatar University. The University of Qatar Library also provides an information literacy program and training in general research skills [14]. Fig. 4 shows the Home page Qatar University Library
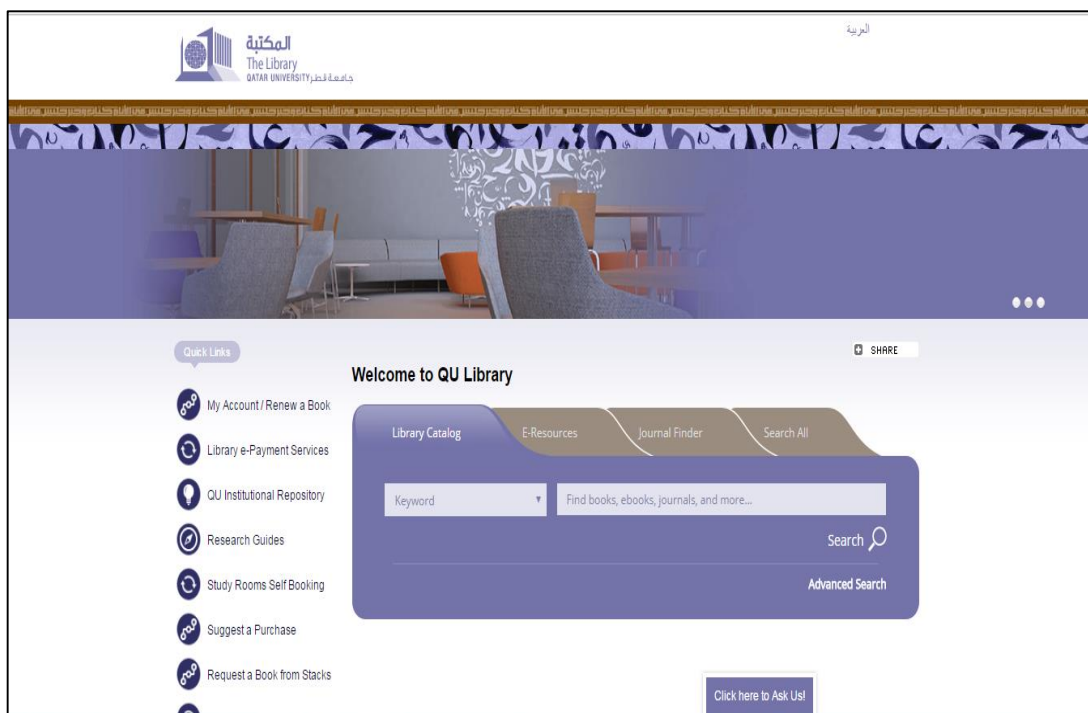
Fig. 4. Home page Qatar University Library

In all these e-libraries there are different functions available to the user like an access to large amounts of information, user-friendly interface, hypertext links for navigation. Additionally, some of them have an advanced search, an integration with other digital libraries, a support of multimedia content along with text, children's services common to public libraries what is shown by having a collection of materials for mathematics, programming as well as materials for parents: reference services, reader's advisory, etc.

There are some disadvantages and missing functions at these sites. Existing systems does not have any facility to the user to borrow the books or check the availability of the books. Also the ability for the user to add request and suggestions for the specific book.

2. DEVELOPMENT OF A SITE

2.1. Functional requirements

Functional requirements are something any project must have in order not to get fail during the work.

The features that are available for a system.

1. The system must give an ability to the user to see statistical reports:

-   the total number of books in each category;

-   the number of borrowed and returned books in the library.

2. The system must give an ability to the user to see the full catalog of books.

3. The system must give an ability to the user to see the books of all categories.

4. The system must make the punishment for a user if the borrowed book was returned in later than he had to.

The features that are available for the administrator.

1. The admin must be able to register and modify information about users' accounts.

2. The admin must be able to edit the information about the existing books, or to add new books to the database.

3. The admin must be able to edit the information about the existing categories, or to add new categories to the database.

4. The admin must be able to check whether the book is available to borrow.

5. The admin must be able to register information about the user, date and book which is borrowed.

6. The admin must be able to register that a book was returned by a user.

7. The admin must be able to remove the user account.

The features that are available for a user.

1. The unregistered user must be able to search any book by: Author; Title; Publish year; Category.

2. The registered user must be able to check whether the book is available to borrow.

3. The registered user must be able to check his borrowed book with the return dates and penalty (if it exists).

4. The unregistered user must be able to register in the library.

5. The registered user must be able to make a request for a new book.

2.2. Use case diagram

Unified Modeling Language (UML) enable IT professionals to model computer applications[22]. This diagram shows seven use cases. There are three types of user: admin, register user, unregister user represented as actors. These actors are connected with these use cases by relationships to show the capability for each user in the system. Fig. 5 show the Use case diagram for the library functions.
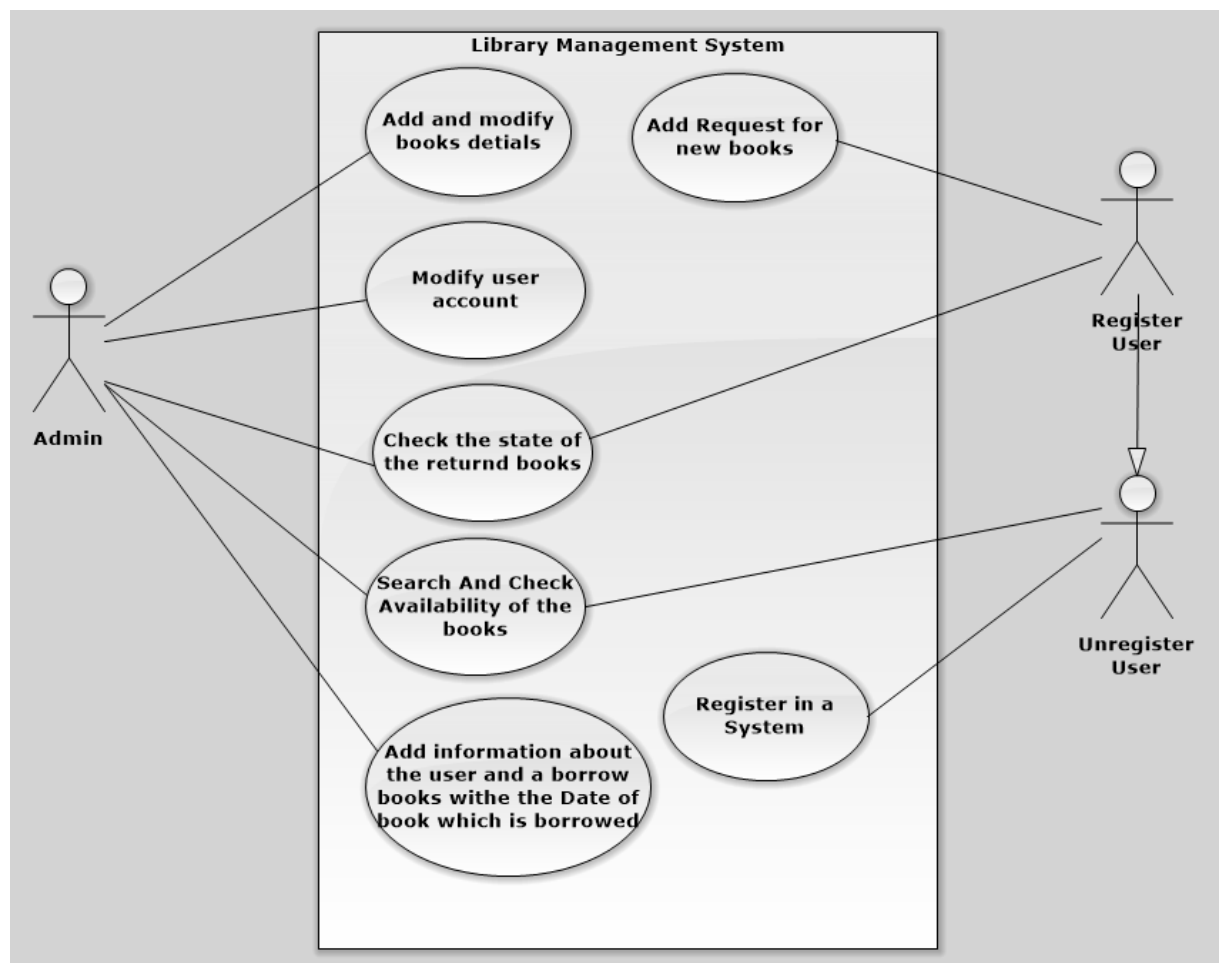
Fig. 5. Use case diagram

Use case "Add and modify books details" is available for the Admin only.

Use case "Modify user account" is available for the Admin only.

Use case "Search And Check Availability of the Books" is available for the Admin, Unregistered User and Registered User as they are connecting with generalize relationship.

Use case "Add information about the user and a borrow books with the Date of book which is borrowed" is available for the Admin only.

Use case "Check the state of the returned books" is available for the Admin and Registered User only for check the expire date for the retuned books and collecting the penalty if exist from the user.

Use case "Add Request for new books" is available for the Register User only.

Use case "Register in a System" is available for the Unregistered User only.

2.3. Development of the database

Database management systems (DBMS) are computer programs designed to manage the storage, maintenance, and retrieval of information from a computer system. The case study titled Library Management System is library management Software for the purpose of monitoring and controlling the transactions in a Library [16]. We need to maintain the record of new books and retrieve the details of books available in the library, which mainly focuses on basic operations in a library like adding new member, new books, and updating new information, searching books and members and facility to borrow and return books, an attractive user interface, searching, insertion and reporting capabilities.

Improvement in control and performance the system is developed to cope up with the current issues and problems of library. The system can add user, validate user.

MySQL, launched in 1995, has become the most popular open source DBMS. Another root cause of MySQL's popularity has been the ongoing success

of phpMyAdmin [15], a well-established MySQL web-based interface. Therefore, many websites use MySQL as their back-end data repository [13].

We decided to specify the following tables of the database:

- the table for books that contain the details of the book in the library like (Name, Author, CoverImage, file name, and other);

- the table for the user that saved the information of users like (Login, Password, Email, MobileNumber, DateBirth, photo, and else);

- the Book Category table that contain the different type of category name in the library for example (Art, Engineer, history, etc.);

- Book Availability table which shows wither there is available book to borrow or not;

- the table which saved the information of the Book Type wither it is (electronic and/or hard copy) that available in the library;

- the table which saved the type of the user (register user or admin) that register in the library;

- the table for Borrowed Books that contain the record of the date of the borrowed books and the expire date;

- the Book Request table ,for the request of the register user for the book that wish to added to library.

The scheme of the database is shown in the fig. 6. It consists of 8 tables, described below.
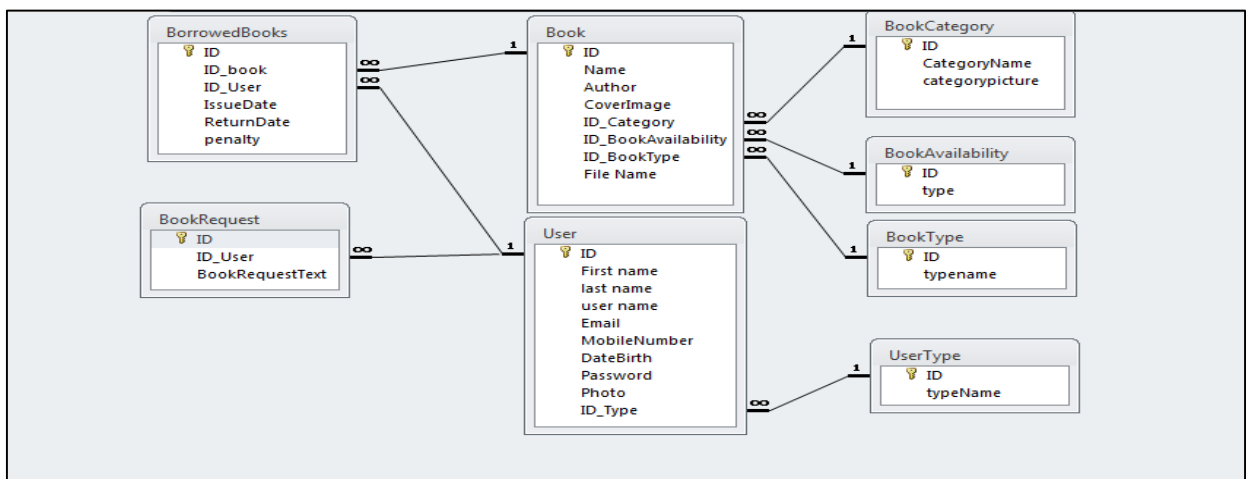
Fig. 6. The scheme of the database

The table "Book" contains information about books in the library. It consists of 8 fields as in the fig. 7.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	ID	int(8)			No	None		AUTO_INCREMENT
2	Name	varchar(50)	latin1_swedish_ci		No	None		
3	Author	varchar(30)	latin1_swedish_ci		No	None		
4	Description	varchar(100)	latin1_swedish_ci		No	None		
5	CoverImage	blob			No	None		
6	ID_Category	int(8)			No	None		
7	ID_BookAvailability	int(8)			No	None		
8	ID_BookType	int(8)			No	None		

Check all — With selected: Browse — Change — Drop — Primary — Unique — Index

Fig. 7. Structure of the table "Book"

The table "User" contain the information of the users that register in the library. It consists of 9 fields as in the fig. 8.

#	Name	Type	Collation	Attributes	Null	Default
1	id	int(3)			No	None
2	firstname	varchar(20)	utf8_general_ci		No	None
3	lastname	varchar(20)	utf8_general_ci		No	None
4	mobile	varchar(20)	utf8_general_ci		No	None
5	dateofbirth	tinytext	utf8_general_ci		No	None
6	email	varchar(50)	utf8_general_ci		No	None
7	username	varchar(20)	utf8_general_ci		No	None
8	password	varchar(50)	utf8_general_ci		No	None
9	mpicture	varchar(50)	utf8_general_ci		No	None

Check all — With selected: Browse — Change — Drop

Fig. 8. Structure of the table "User"

The table "Book Category" saves the different type of category that library will contain. It consists of 2 fields as in the fig. 9.

Fig. 9. Structure of the table "Book Category"

The table "BookAvailability" saves the status of book that available to borrow by the user . It consists of 2 fields as in the fig. 10.

Fig. 10. Structure of the table "BookAvailability"

The table "BookType" save the type of copy (electronic and/or hard copy) of the books that available in the library. It consists of 2 fields as in the fig.11.

Fig. 11. Structure of the table "BookType"

The table "UserType", "Universities" save the type of different user that register in the library. It consists of 2 fields as in the fig. 12.

Fig. 12. Structure of the table "UserType"

The table "BorrowedBooks" saves the detail of the book that borrow. It consists of 7 fields as in the fig. 13.

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	id 🔑	int(3)			No	None		
☐	2	userbname	varchar(20)	utf8_general_ci		No	None		
☐	3	bookbid	varchar(20)	utf8_general_ci		No	None		
☐	4	bookbname	varchar(100)	utf8_general_ci		No	None		
☐	5	authorb	varchar(50)	utf8_general_ci		No	None		
☐	6	categoryb	varchar(30)	utf8_general_ci		No	None		
☐	7	borrowdate	tinytext	utf8_general_ci		No	None		
☐	8	returndate	tinytext	utf8_general_ci		No	None		
☐	9	status	varchar(30)	utf8_general_ci		No	None		
☐	10	penalty	varchar(50)	utf8_general_ci		No	None		
☐	11	bpicture	varchar(50)	utf8_general_ci		No	None		

Fig. 13. Structure of the table "BorrowedBooks"

The table "BookRequest" saves information about the request of the user. It consists of 3 fields as in the fig. 14.

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	ID 🔑	int(8)			No	None		AUTO_INCREMENT
☐	2	ID_User	int(8)			No	None		
☐	3	BookRequest	varchar(50)	latin1_swedish_ci		No	None		

↑__ ☐ Check all   With selected: 🗒 Browse   ✎ Change   ⊖ Drop   🔑 Primary   🔵 Unique

Fig. 14. Structure of the table "BookRequest"

A DBMS is a powerful tool for creating and managing large amounts of data efficiently and allowing it to persist over long periods, safely. These systems are among the most complex types of software available [4]. These 8 tables will contain all the details for the books and users in the library.

2.4. Development of the interface

The user interface, also known as Human Machine Interface (HMI) or Man-Machine Interface (MMI), is the aggregate of means by which users interact with the system – a particular machine, device, computer program or other complex tool. The part of an interactive computer program sends messages to and

receives instructions from a terminal user. User Interface Design and Ergonomics deals with analysis, design, implementation and evaluation of user interface design [16].

We will implement future views of an application. Fig. 15 shows the main page for the web site of a system for online library interface.

The users who visit the website can check and read books in the library. They can visit the different section in the library by pressing different buttons in the upper side of the web page "Dashboard", "Admin", "Contact Us", and "Advance search" or simple search bar. They can login to the website by enter his username and password if he had already registered before, otherwise he can create a new user account in "Create an account" section. It will lead him to the register page, which is shown below (fig. 16).

| Home | Admin | Dashboard | Contact Us | Search/Advance Search |

General information Description about Online Library System

Photo

Latest News
Date
Title
Text

Date
Title
Text

Date
Title
Text

Login Form

Username

Password

Login
Forgot your password?
Forgot your username?
Create an account

Fig. 15. The main page

Figure 16 shows the page for the user registering.

The user can register by insert his information "Fist Name", "Last Name", "Mobile Number", "Date Birth", "E-mail", "Password".

Fig. 16. The page for the user registering

The user can upload his photo optionally. The registered user will be able to borrow books or send a request about the books that desire add it to the library.

"Dashboard" is the second section of the website.

The user can see the different categories in the library, some recommended books.

The registered user can add request for the book that not available in the library by the "add request" button in the bottom side as in fig. 17.

The user can see all the categories list or all the books list in the library by click on "Browse By All The Categories", and "Browse By All The Books" as in fig. 18, 19.

In the fig. 18 below, you can see the list of category in the library.

In the fig. 19 below, you can see the list of the books in the library.

By press on any book it will open the book details with the button "read" for the user to read the book online. Fig. 20 shows the book detail page.

| Home | Dashboard | Contact Us | Search/Advance Search |

Browse By All The Categories

| Category Cover | Category Cover | Category Cover | Category Cover | Category Cover | Category Cover | Category Cover |

Browse By All Books

| Book Cover | Book Cover | Book Cover | Book Cover | Book Cover | Book Cover | Book Cover |

Add Book Request
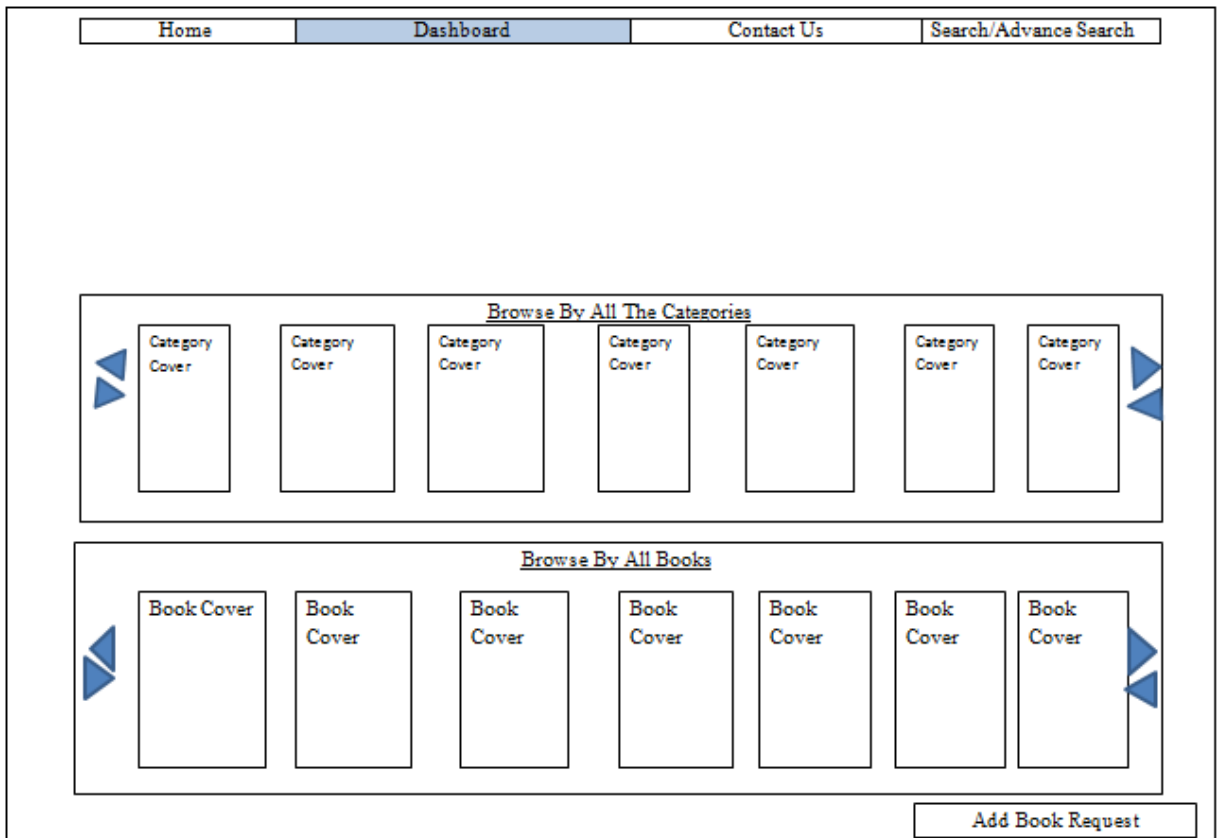
Fig. 17. The Dashboard page

| Home | Admin | Dashboard | Contact Us | Search/Advance Search |

Browse By All The Categories

Category Cover

Category Name

······

Category Cover

Category Name

Category Cover

Category Name

Category Cover

Category Name
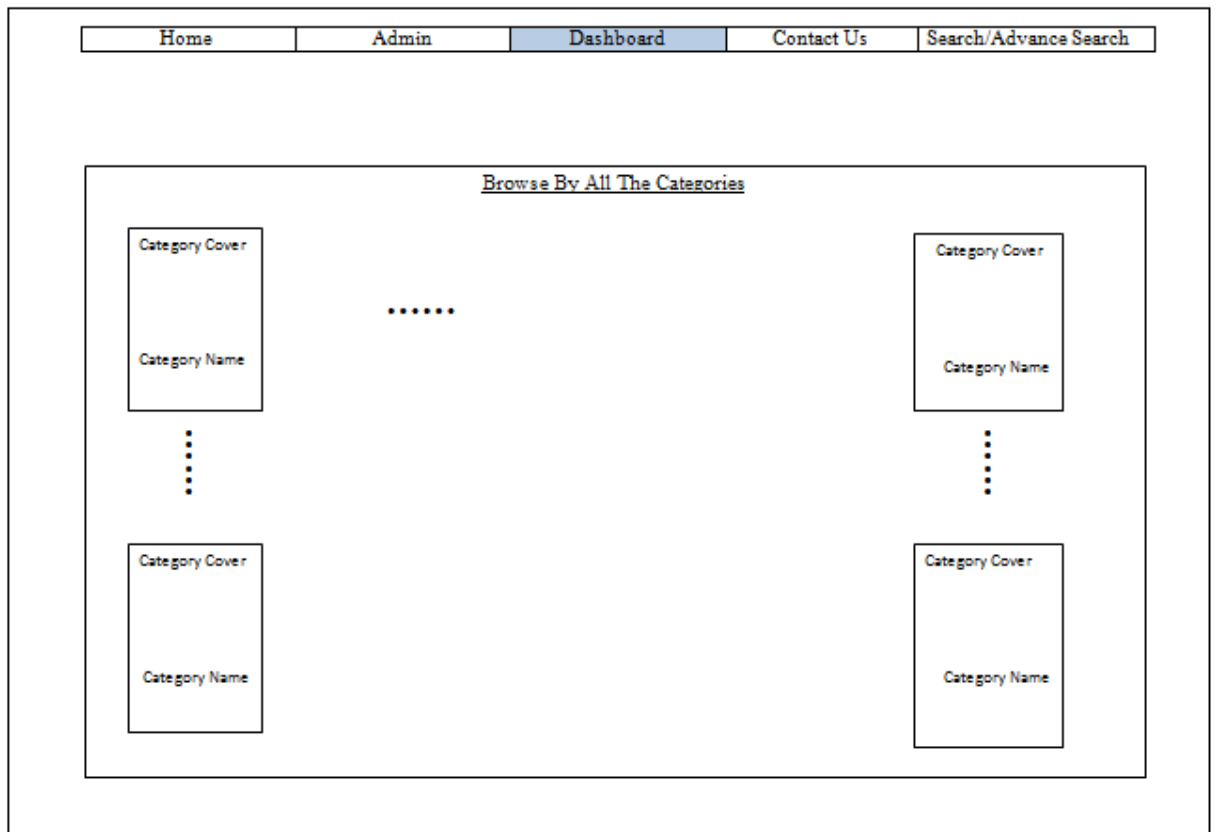
Fig. 18. Browse By All Categories
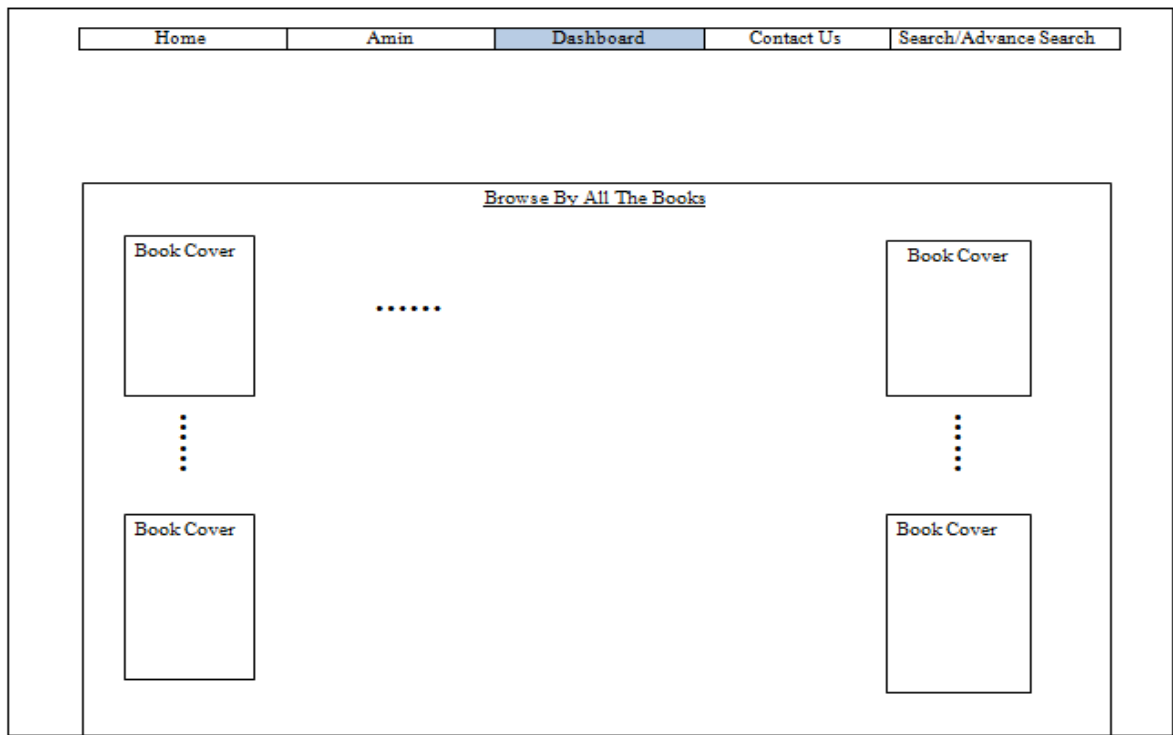
Fig. 19. Browse By All The Books
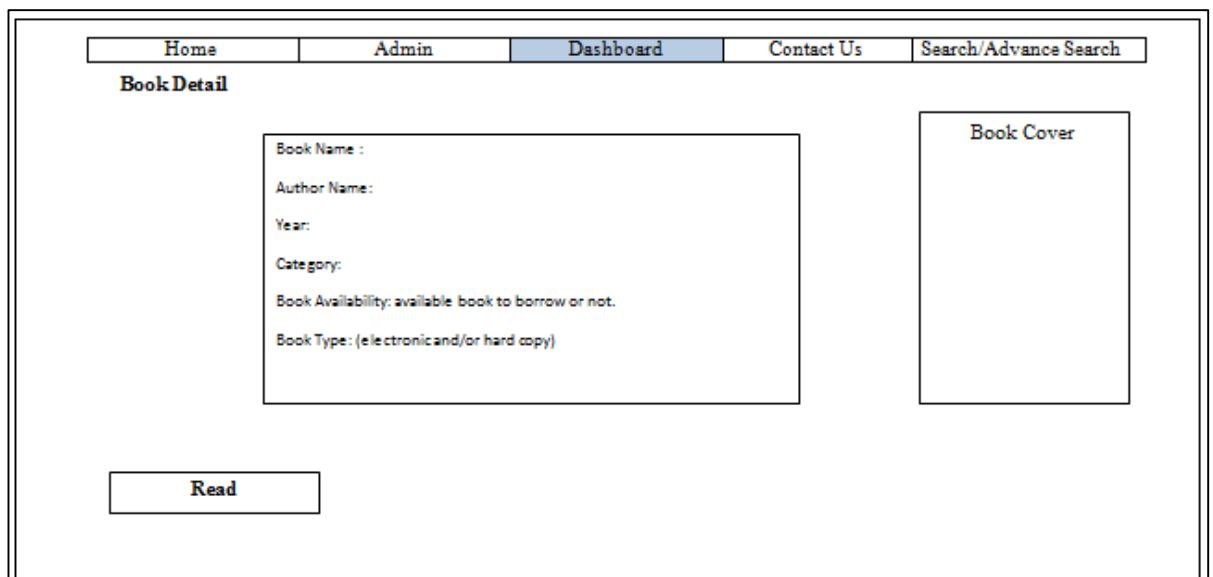
Fig. 20. Page for book details

In addition, the register user has the ability to send request for book that the reader wish to see it in the library. Fig. 21 shows the book request page.

"Contact Us" is the third section in the website. This section is specified to communicate with the website administrator as show in fig. 22, for any request or problems.

Fig. 21. Page for send a book request

Fig. 22.Contact Us

"Advance Search" is the third section of the main page. This section help the user to search in specific category or for specific author as show in fig. 23 below.

Fig. 23. Advance Search

"Admin" is the fifth section of the main page. The administrator can enter his special username and password. His special main page views as in the fig. 24.

Fig. 24. The Admin page

"Staff Tools" is the first button in administrator's main page, which is devoted to add new staff or modify the account as in fig. 25 and fig. 26.

Fig. 25. Add Staff page

Fig. 26 shows the page for Modify Staff Profile.
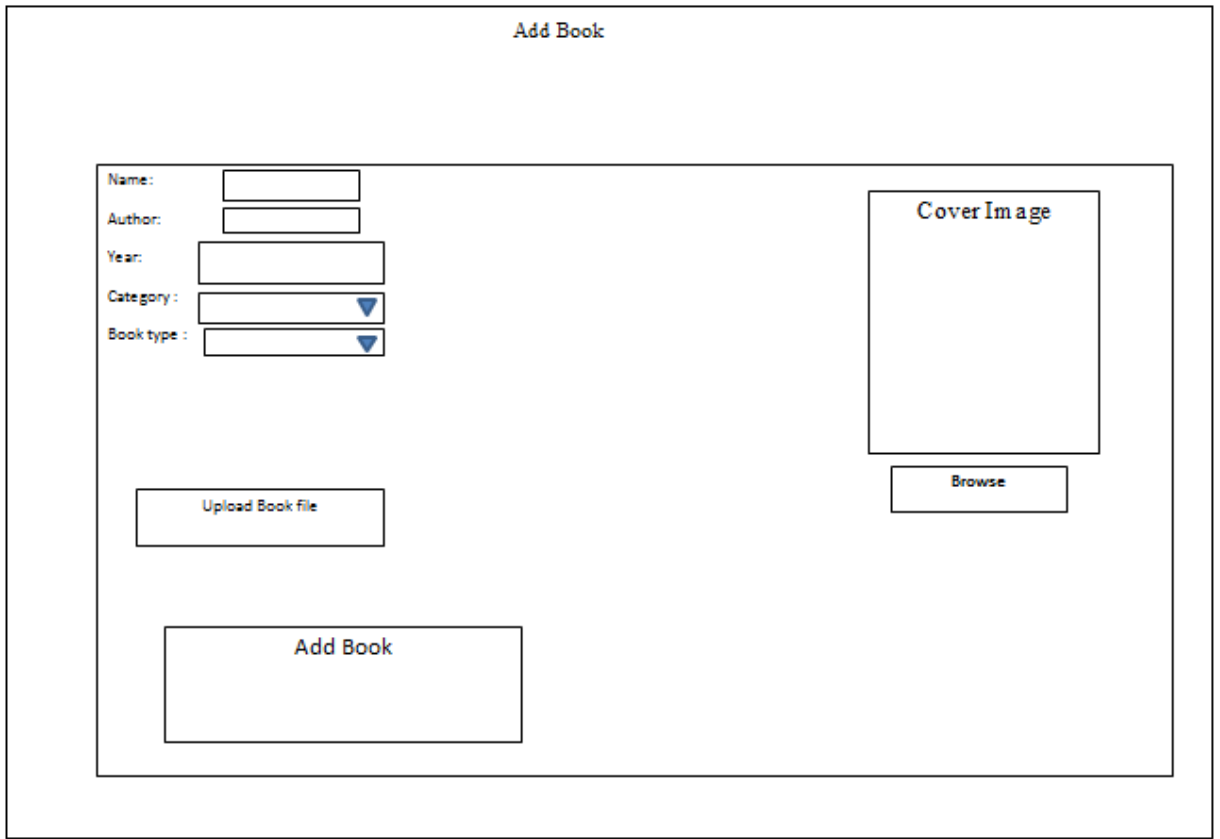
Fig. 26. Modify Staff page
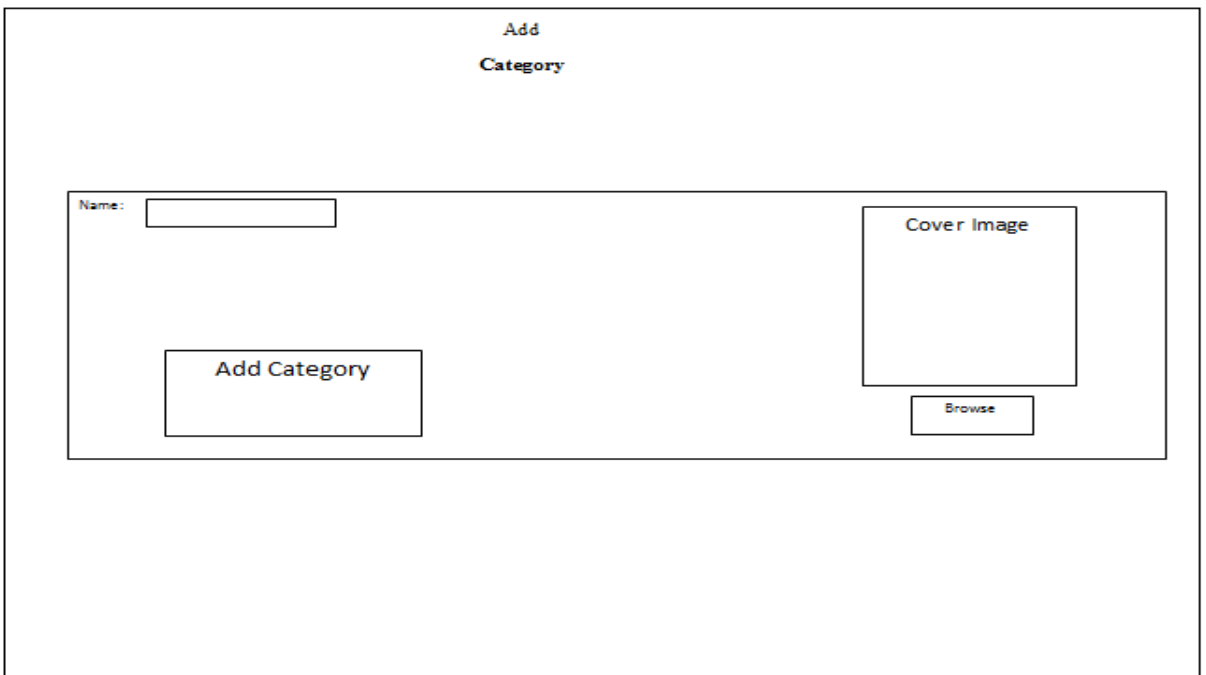
"Add" is the second button in administrator's main page, which is devoted to add new users, books, and category as in fig. 27, 28 and fig. 29.

Fig. 27. Add Book page
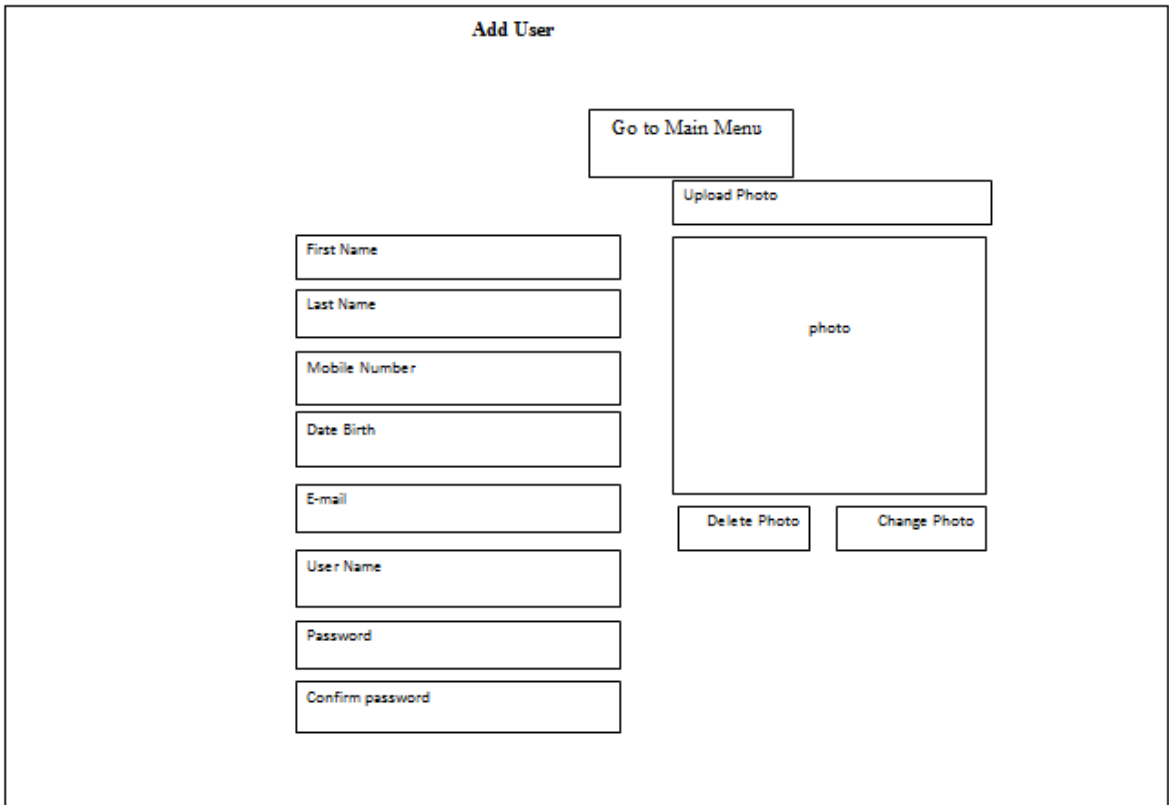
Fig. 28 shows the page for admin to Add new category.

Fig. 28. Add Category page
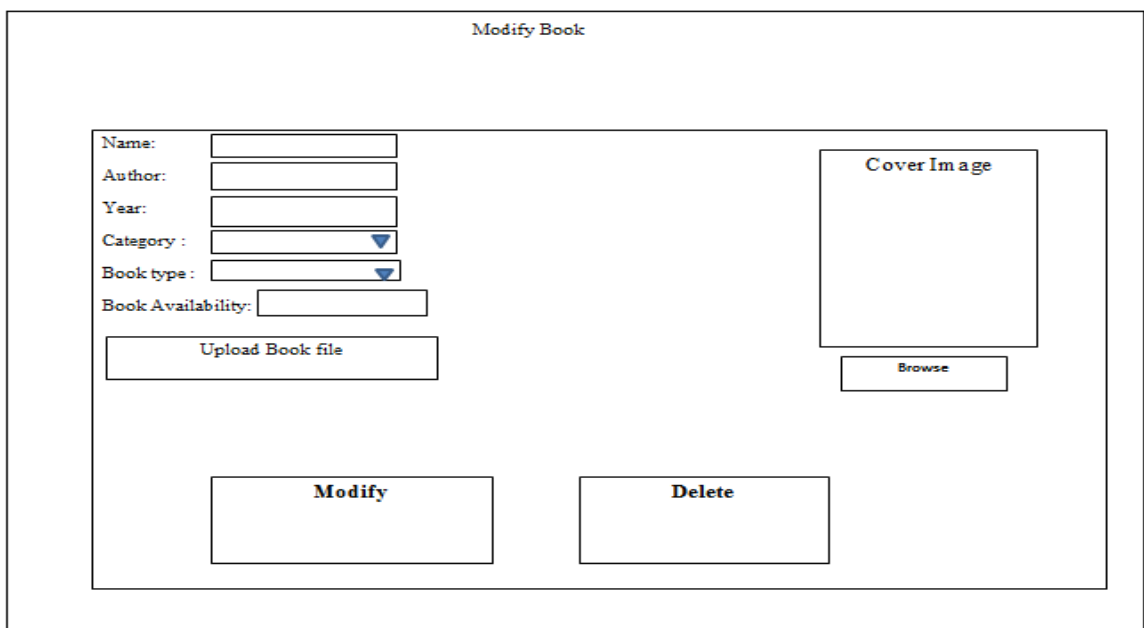
Fig. 29 shows the page for admin to Add new user.

Fig. 29. Add user page

"Modify" is the third button in administrator's main page, which is devoted to modify information for existing books, categories, and users as shown in fig. 30, 31 and fig. 32.

Fig. 30. Modify Book page

Fig. 31 shows the page for admin to modify category.

Fig. 31. Modify category page

Fig. 32 shows the page for admin to modify user account.
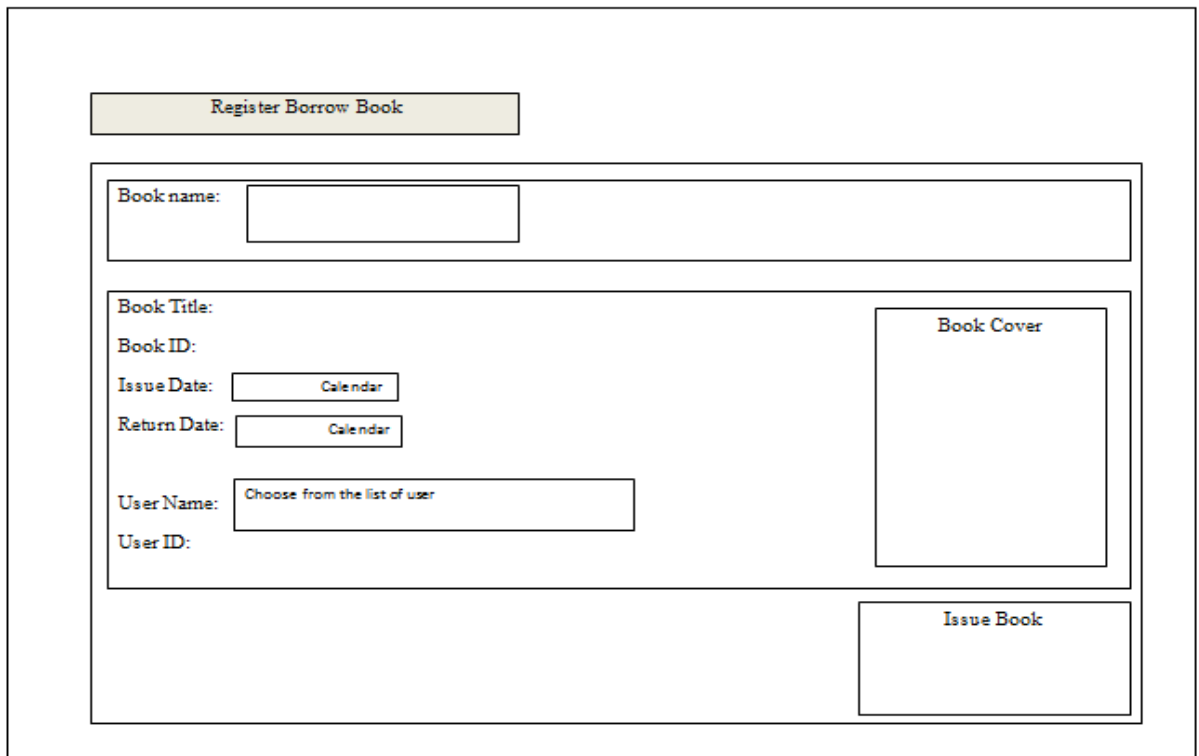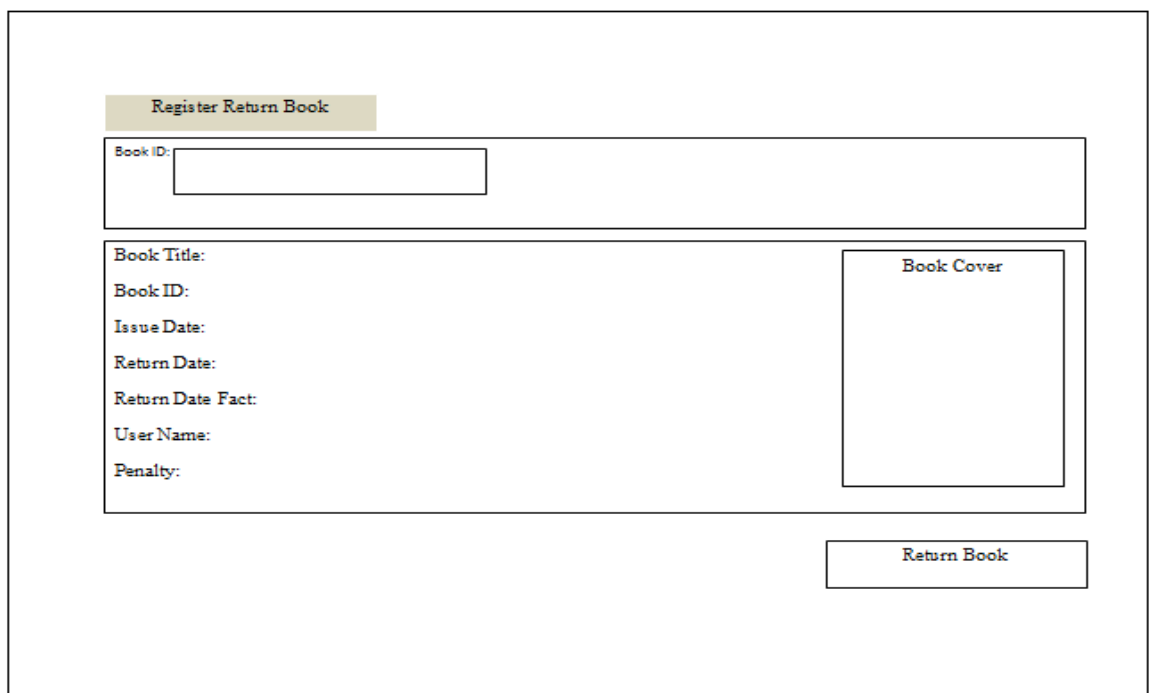

Fig. 32. Modify User page

"Book" is the forth button in administrator's main page, which is devoted to "Register Borrow Book", "Register Return Book", And "Check Expire date" as show in fig. 33, 34 and fig. 35.

Fig. 33. Register Borrow Book page
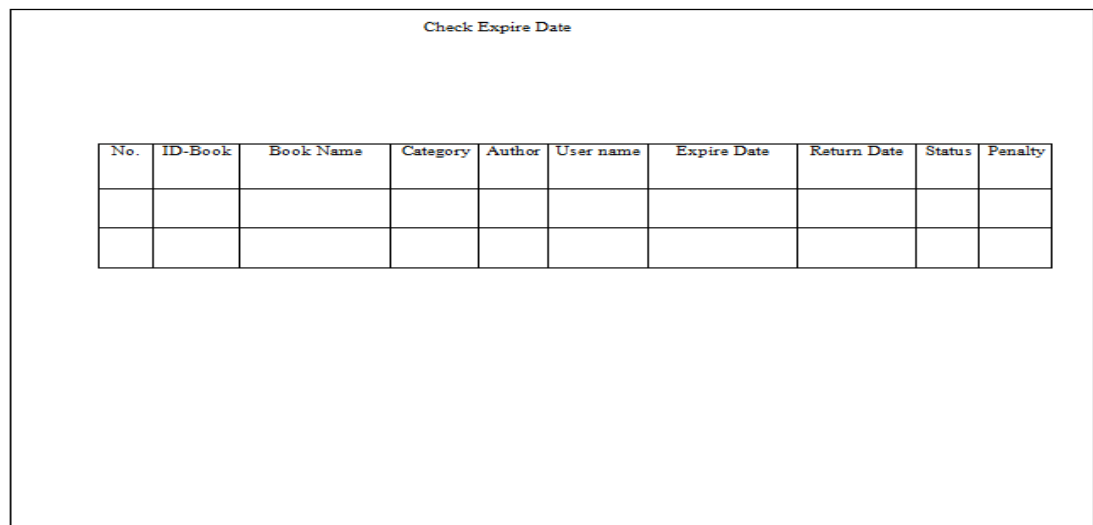
Fig. 34 shows the page for admin to Register Return Book.

Fig. 34. Register Return Book page

Fig. 35 shows the page for admin to check borrowed and returned book with expire date and penalty if exist.

No.	ID-Book	Book Name	Category	Author	User name	Expire Date	Return Date	Status	Penalty

Fig. 35. Check Expire Date page

These interfaces show how the user will interact with the website and how the information will appear from the side of the end user view.

3. IMPLEMENTATION OF THE LIBRARY SYSTEM
WITH A WEB-INTERFACE
3.1. Architecture of the system

Component diagram is kind of diagram found in modeling the physical aspects of object oriented system. Component diagram represents the logical part of the system that interacts with other parts though interfaces [3].

Fig. 36 below shows the structural relations between components in the library system "admin", "controller", and "html" which contain the most contents of the online library system.
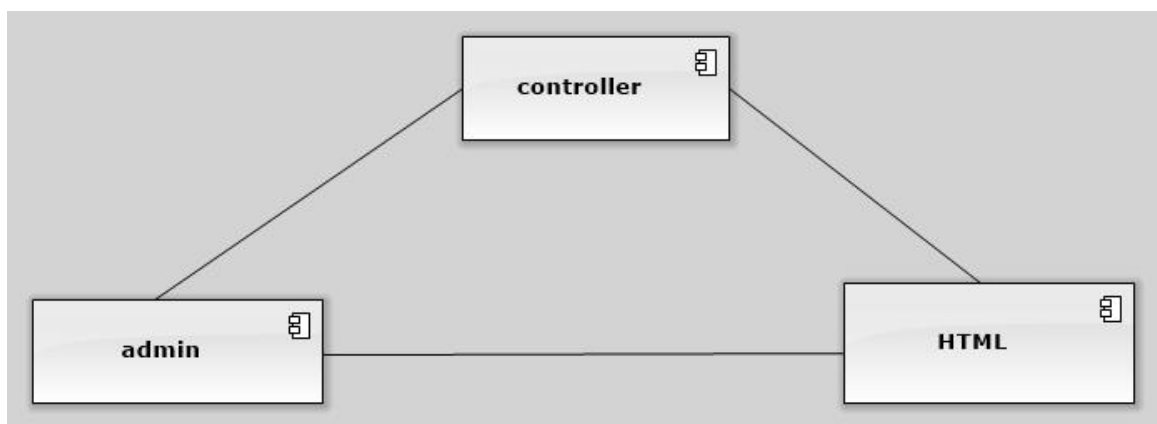
Fig. 36. Component diagram

The component "controller" contains the php-files for user login, register admin, register user, category view, category modify, book view, user view, book modify, user modify, add book, add category, and search.

The component "admin" contains the php-files for some functions that available for the admin like modify staff, modify user, issue book, and return book.

The component "HTML" contains the php-files for website interface like home, admin, dashboard, log-in, search, request book, register, edit my profile, all categories, all books, request password, request username, and contact-us.

We use component diagram to visualize the static aspect of the physical component and their relationship and to specify their details for construction [3].

3.2. Several fragments of PHP-code for implementing the basic functionality

Within the system, I built the design for twenty-six web-pages, some of which are simple and others are rather complex. Many of them duplicate each other.

Register in the system. Fig. 37 shows the function for the user to register in the system by entering his information like his "First Name", "Last Name", "Mobile number", "Date Birth", "Email", "Username", and "password".

```php
// <!-- Register a Member... -->
$query = "Select Max(id) From members";
$returnD = mysql_query($query);
$result = mysql_fetch_assoc($returnD);
$maxRows = $result['Max(id)'];
if(empty($maxRows)){
    $lastRow = $maxRows = 1;
}else{
    $lastRow = $maxRows + 1 ;
}
if(isset($_REQUEST['registerBtn'])){
    $memberId = $_REQUEST['memberId'];
    $FirstName = $_REQUEST['FirstName'];
    $LastName = $_REQUEST['LastName'];
    $MobileNo = $_REQUEST['MobileNo'];
    $DateBirth = $_REQUEST['DateBirth'];
    $Email = $_REQUEST['Email'];
    $Username = $_REQUEST['Username'];
    $Password = $_REQUEST['Password'];
    $avatarpic = $_FILES['avatarpic'];
    $actualFileName = $avatarpic['name'];
    $tmpName = $avatarpic['tmp_name'];
    //$type = $avatarpic['type'];
    //$size = $avatarpic['size'];
    //$error = $avatarpic['error'];
    $targetLocation = "../images/members/$actualFileName";
```

Fig. 37. Function for register user

Login form (fig. 38) shows the function for the already registered user to login in the system by enter his user name and password.

```
// <!-- Member Log In... -->
if(isset($_REQUEST['LoginBtn'])){
    $UserName= $_REQUEST['UserName'];
    $Password= $_REQUEST['Password'];
    if(!empty($UserName) && !empty($Password)){
        $query = mysql_query("SELECT id, username, password FROM members WHERE username = '$UserName' && password = '$Password'");
        $result = mysql_fetch_assoc($query);
            if($UserName == $result['username'] && $Password == $result['password']){

                $_SESSION['UserName'] = $result['username'];
                $_SESSION['Password'] = $result['password'];
                header("location:../html/home.php");
            }
            else{
                header("location:../html/log-in.php");
                $errorMsg = "Invalid User....";
            }
    }
    else{
        header("location:../html/log-in.php");
        $errorMsg = "Enter in empty field...";
    }
}
```

Fig. 38. Log in form

Recovering for the username and password (fig. 39–40). Each user who has lost his password or username can put his email address to receive his login information as a message sent to his email.

```
// <!-- Forget UserName... -->
if(isset($_REQUEST['ObtainUsrPtn'])){
    $Email= $_REQUEST['Email'];
    if(!empty($Email)){
        $query = mysql_query("SELECT email, username, password FROM members WHERE email = '$Email'");
        $result = mysql_fetch_assoc($query);
            if($Email == $result['email']){
                $_SESSION['email'] = $result['email'];
                $_SESSION['username'] = $result['username'];
                $_SESSION['password'] = $result['password'];
                $sendto = $result['email'];
                $subject = "Your UserName";
                $message = "Hello Customer! Your User Name is ";
                $message .= $result['username'];
                $from = "From: engcon < http://www.engconsults.com/ > <engcon@engconsults.com>";
                mail($sendto,$subject,$message,$from);
                header("location:../html/log-in.php");
            }
            else{
                header("location:../html/requestusername.php");
                $errorMsg = "Invalid E@mail....";
            }
    }
    else{
        header("location:../html/requestusername.php");
        $errorMsg = "Please ! Enter Authorised's E@mail...";
    }
}
```

Fig. 39. Function for recovering the username

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Fig. 40. Shown the Function for recovering the password.

```php
// <!-- Forget PASSWORD... -->
if(isset($_REQUEST['SendPassPtn'])){
    $Email= $_REQUEST['Email'];
    if(!empty($Email)){
        $query = mysql_query("SELECT email, username, password FROM members WHERE email = '$Email'");
        $result = mysql_fetch_assoc($query);
            if($Email == $result['email']){
                $_SESSION['email'] = $result['email'];
                $_SESSION['username'] = $result['username'];
                $_SESSION['password'] = $result['password'];
                $sendto = $result['email'];
                $subject = "Your Password";
                $message = "Hello Customer! Your Password is ";
                $message .= $result['password'];
                $from = "From: engcon < http://www.engconsults.com/ > <engcon@engconsults.com>";
                mail($sendto,$subject,$message,$from);
                header("location:../html/log-in.php");
            }
            else{
                header("location:../html/requestresetpassword.php");
                $errorMsg = "Invalid E@mail....";
            }
    }
    else{
        header("location:../html/requestresetpassword.php");
        $errorMsg = "Please ! Enter Authorised's E@mail...";
    }
}
```

Fig. 40. Function for recovering the password

Displaying the full information for the staff to control the library. The staff can control adding or modifying the user and the book in the library. Fig. 41 shows the function for the staff to add new books to the library.

```php
// <!-- Add new Book... -->

$query = "Select Max(id) From books";
$returnD = mysql_query($query);
$result = mysql_fetch_assoc($returnD);
$maxRows = $result['Max(id)'];
if(empty($maxRows)){
    $lastRow = $maxRows = 1;
}else{
    $lastRow = $maxRows + 1 ;
}
if(isset($_REQUEST['registerBtn'])){
    $Id = $_REQUEST['Id'];
    $BookId = $_REQUEST['bookId'];
    $BookName = $_REQUEST['bookName'];
    $AuthorName = $_REQUEST['authorName'];
    $BookYear = $_REQUEST['bYear'];
    $Category = $_REQUEST['Category'];
    $BookAvailabe = $_REQUEST['bookAvailabe'];
    $BookType = $_REQUEST['bookType'];
    $bookpic = $_FILES['bookpic'];
    $actualFileName = $bookpic['name'];
    $tmpName = $bookpic['tmp_name'];
    //$type = $bookpic['type'];
    //$size = $bookpic['size'];
    //$error = $bookpic['error'];
    $targetLocation = "../images/books/$actualFileName";
```

Fig. 41. Adding a new book

The staff can show the details for book, category, and user as show in fig. 42 (the function for viewing category details).

```php
// <!-- View All... -->
if(isset($_REQUEST['Category'])){
                $file = "cover.png";
                $result['cpicture'] = $file;
                $_SESSION['CoverPic'] = $result['cpicture'];
        include("location:categoryview.php");                }
elseif(isset($_REQUEST['Category']) && isset($_REQUEST['viewBtn'])){
    $query = mysql_query("SELECT * FROM categories");
    $result = mysql_fetch_assoc($query);
        $_SESSION['ID'] = $result['id'];
        $_SESSION['CategoryId'] = $result['categoryid'];
        $_SESSION['CategoryName'] = $result['categoryname'];
        $_SESSION['SearchAbout'] = $result['categoryname'];
            if(!empty($result['cpicture'])){
                $_SESSION['CoverPic'] = $result['cpicture'];
            }
            else{
                $file = "cover.png";
                $result['cpicture'] = $file;
                $_SESSION['CoverPic'] = $result['cpicture'];
            }
        $info = array("Category" => ['id'], ['categoryid'], ['categoryname'], ['cpicture']);
        $_SESSION['Category'] = $info;
        include("location:categoryview.php");
}
```

Fig. 42. Function for view category

The staff can control and modify user details account as in function shown in fig. 43.

```php
// <!-- Modify a Member... -->
if(isset($_REQUEST['ModifyBtn'])){
    $memberId = $_REQUEST['memberId'];
    $FirstName = $_REQUEST['FirstName'];
    $LastName = $_REQUEST['LastName'];
    $MobileNo = $_REQUEST['MobileNo'];
    $DateBirth = $_REQUEST['DateBirth'];
    $Email = $_REQUEST['Email'];
    $Username = $_REQUEST['Username'];
    $Password = $_REQUEST['Password'];
    $avatarpic = $_FILES['avatarpic'];
    $actualFileName = $avatarpic['name'];
    $tmpName = $avatarpic['tmp_name'];
    //$type = $avatarpic['type'];
    //$size = $avatarpic['size'];
    //$error = $avatarpic['error'];
    $targetLocation = "../images/members/$actualFileName";
    move_uploaded_file($tmpName, $targetLocation);

        $query = mysql_query("UPDATE members Set firstname='$FirstName', lastname='$LastName',
        mobile='$MobileNo', dateofbirth='$DateBirth', email='$Email', username='$Username',
        password='$Password', mpicture='$actualFileName' Where id='$memberId'");

        if($query){
            //$errorMsg = "Updation is successfully done.";
            header("location:../controller/logout.php");
        }
        else{
            header("location:../html/log-in.php");
            $errorMsg = "Invalid User....";
        }
}
else{
    header("location:../html/log-in.php");
    $errorMsg = "Enter in empty field...";
}
```

Fig. 43. Function for modify user account

Register Borrow and Return book. The staff can register the book to specific user for specific time, to unregister the return book from the user as shown in (fig. 44-45). The staff able to check the borrowed and returned books with the date and users of the register book as shown in the function in fig. 46.

```php
// <!-- Issue a New Book... -->
$timezone = date_default_timezone_get();
$date = date('d/m/Y H:i:sa', time());


$query = "Select Max(id) From borrow";
$returnD = mysql_query($query);
$result = mysql_fetch_assoc($returnD);
$maxRows = $result['Max(id)'];
if(empty($maxRows)){
    $lastRow = $maxRows = 1;
}else{
    $lastRow = $maxRows + 1 ;
}


if(isset($_REQUEST['issueBtn'])){

    $ID = $_REQUEST['Id'];
    $UserName = $_REQUEST['selectuser'];
    $BookId = $_REQUEST['bookId'];
    $BookName = $_REQUEST['bookName'];
    $Author = $_REQUEST['authorName'];
    $Category = $_REQUEST['Category'];
    $BorrowDate = $_REQUEST['borrowDate'];
    $Status = $_REQUEST['status'];
    $BookPic = $_REQUEST['bookpic'];
```

Fig. 44. Function for Register Borrow book

Fig. 45. Shown the Function for Register Return book

Fig. 46. Shown the Function for Check Expire Date.

```php
// <!-- Return a Borrowed Book... -->
$timezone = date_default_timezone_get();
$date = date('d/m/Y H:i:sa', time());

$query = "Select Max(id) From returnb";
$returnD = mysql_query($query);
$result = mysql_fetch_assoc($returnD);
$maxRows = $result['Max(id)'];
if(empty($maxRows)){
    $lastRow = $maxRows = 1;
}else{
    $lastRow = $maxRows + 1 ;
}

if(isset($_REQUEST['returnBtn'])){

    $ID = $_REQUEST['Id'];
    $UserName = $_REQUEST['selectuser'];
    $BookId = $_REQUEST['bookId'];
    $BookName = $_REQUEST['bookName'];
    $Author = $_REQUEST['authorName'];
    $Category = $_REQUEST['Category'];
    $ReturnDate = $_REQUEST['returnDate'];
    $Status = $_REQUEST['status'];
    $BookPic = $_REQUEST['bookpic'];
```

Fig. 45. Function for Register Return book

```php
// <!-- Check Expire Date of a Book... -->
$timezone = date_default_timezone_get();
$date = date('d/m/Y H:i:sa', time());

$query = "Select Max(id) From borrow";
$returnD = mysql_query($query);
$result = mysql_fetch_assoc($returnD);
$maxRows = $result['Max(id)'];
if(empty($maxRows)){
    $lastRow = $maxRows = 1;
}else{
    $lastRow = $maxRows + 1 ;
}

if(isset($_REQUEST['issueBtn'])){

    $ID = $_REQUEST['Id'];
    $UserName = $_REQUEST['selectuser'];
    $BookId = $_REQUEST['bookId'];
    $BookName = $_REQUEST['bookName'];
    $Author = $_REQUEST['authorName'];
    $Category = $_REQUEST['Category'];
    $BorrowDate = $_REQUEST['borrowDate'];
    $Status = $_REQUEST['status'];
    $BookPic = $_REQUEST['bookpic'];
```

Fig. 46. Check Expire Date

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Search for the Book in simple and Advance form. The user can make simple search for the book by entering the name of the book. Fig. 47 shows the function for a simple search. Additionally, the user can make an advance search by enter the name of the "Book", "Author", "Category", and "Year of publish" as shown in fig. 48.

```php
// <!-- Search About All... -->
if(isset($_POST['searchField']) || isset($_POST['searchallBtn'])){
    $searchquery = $_POST['searchField'];
            $query = mysql_query("SELECT * FROM books WHERE bookid LIKE '%$searchquery%' OR bookname LIKE
            '%$searchquery%' OR author LIKE '%$searchquery%' OR byear LIKE '%$searchquery%' OR category LIKE
            '%$searchquery%' OR booktype LIKE '%$searchquery%' OR bookavailabe LIKE '%$searchquery%'");
            $count = mysql_num_rows($query);
                if($count >= 1){
                    $search_output .= "<br />$count results for <strong>$searchquery</strong><br />";
                    while($row = mysql_fetch_array($query)){
                    $queryArray[] = $row;
                    } // close while

                    $_SESSION['search_output'] = $queryArray;
                    header("location:../html/viewall.php");
                }
                else {
                    $goodQuery = false;
                    $search_output = "<br />0 results for <strong>$searchquery</strong><br />";
                    echo $search_output;
                    header("location:../html/search.php");
                    $errorMsg = "Invalid Search...";
                }
}
else{
    header("location:../html/search.php");
    $errorMsg = "Enter in empty field...";
}
```

Fig. 47. Function for simple search

Fig. 48. Shown Function for advance search.

```php
// <!-- Advance Search ... -->
if(isset($_REQUEST['SearchBtn']) && !empty($_REQUEST['searchabout']) && !empty($_REQUEST['searchselect'])){
    $SearchAbout= $_REQUEST['searchabout'];
    $SearchSelect= $_REQUEST['searchselect'];
        if($SearchAbout == 'Author'){
                $query = mysql_query("SELECT * FROM books WHERE author LIKE '%$SearchSelect%'");
                $count = mysql_num_rows($query);
                    if($count >= 1){
                        $search_output .= "<br />$count results for <strong>$SearchSelect</strong><br />";
                        while($row = mysql_fetch_array($query)){
                        $queryArray[] = $row;
                        } // close while
                        $_SESSION['search_output'] = $queryArray;
                        header("location:../html/viewall.php");
                    }
                    else {
                        $goodQuery = false;
                        $search_output = "<br />0 results for <strong>$SearchSelect</strong><br />";
                        echo $search_output;
                        header("location:../html/search.php");
                        $errorMsg = "Invalid Search...";
                    }
        }
        elseif($SearchAbout == 'Book Name'){
                $query = mysql_query("SELECT * FROM books WHERE bookname LIKE '%$SearchSelect%'");
                $count = mysql_num_rows($query);
                    if($count >= 1){
                        $search_output .= "<br />$count results for <strong>$SearchSelect</strong><br />";
                        while($row = mysql_fetch_array($query)){
                        $queryArray[] = $row;
                        } // close while
                        $_SESSION['search_output'] = $queryArray;
                        header("location:../html/viewall.php");
```

Fig. 48. Function for advance search

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3.3. The implementation of the algorithm of the penalty calculation in the web-application

The algorithm of the penalty calculation for the users is shown in fig. 49.

It calculates penalty for each user by the system.

It calculates penalty for return book by comparing the return date (RD) with the current date (CD) and calculation of the subtraction of them.
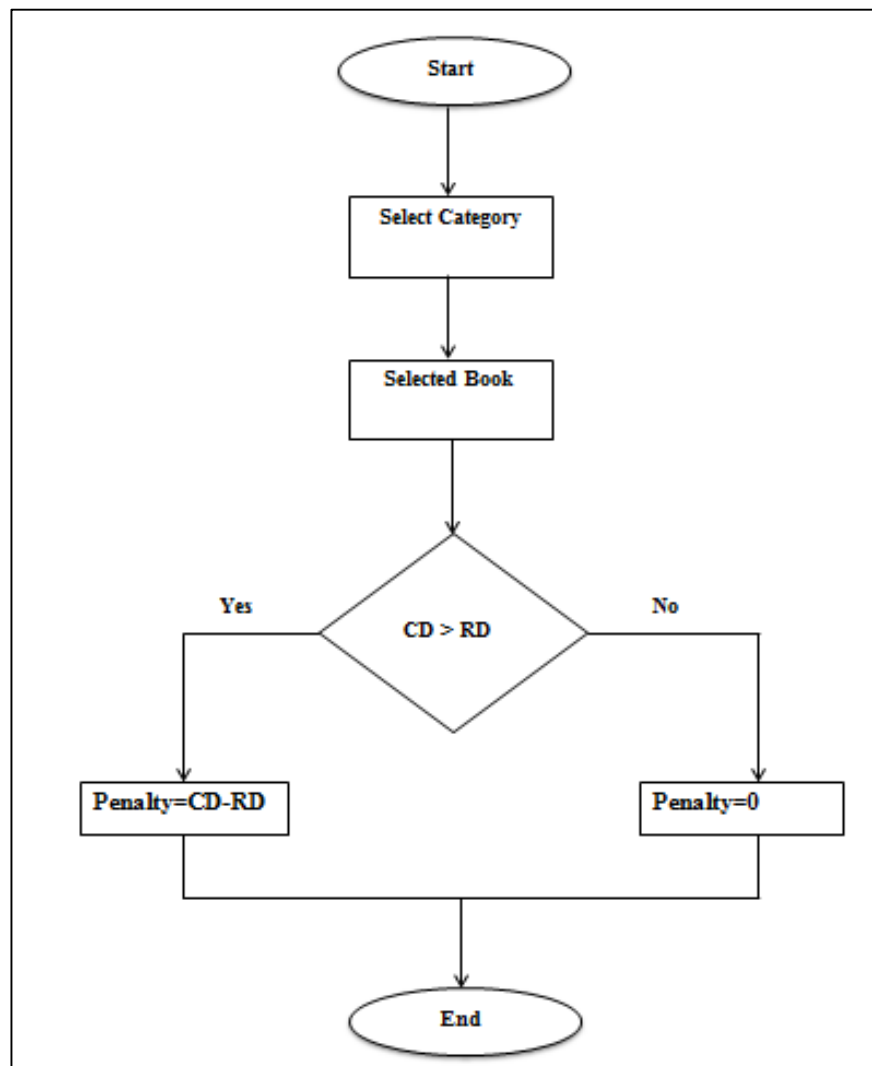

Fig. 49. The algorithm of penalty calculation

This part shows the different implementation code for the functions that the library provided to the user to give him the ability to work in the website.

4. TESTING OF THE WEB APPLICATION

4.1. The used methods of testing

Functional system tests should be based around coverage of the functionality described in the requirements, but it is common for the design document to be used as the baseline for testing because the requirements cannot be related to the final product. In the worst case, system tests can become large-scale repetitions of unit tests [6]. Each test of my system contains input and output information. Therefore, we compare the actual results and the expected results (tab. 2).

Table 2. The protocol of functional testing of the site

No.	Function	Expected result	Obtained result	Conclusion
1.	To show the home page	Any visitor can watch this page with the list of the main sections	Any visitor can only watch this page with the list of the main sections	The function works
2.	To give all users the permission to see the registration page	Any visitor can see the registration page	Any visitor can see the registration page	The function works
3.	To give all users the permission to see the login page	Any visitor can see the login page	Any visitor can see the login page	The function works
4.	To give the user who lost his password the permission to see the page for recovering of his password	Any visitor can see the page for recovering of the password	Any visitor can see the page for recovering of the password	The function works
5.	To give the user who lost his username the permission to see the page for recovering of his username	Any visitor can see the page for recovering of the username	Any visitor can see the page for recovering of the username	The function works
6.	To give all visitors the permission to see the page "Dashboard"	Any visitor can see the page "Dashboard" with the list of the main sections	Any visitor can see the page "Dashboard" with the list of the main sections	The function works

No.	Function	Expected result	Obtained result	Conclusion
7.	To give all visitors the permission to see the page "Contact us"	Any visitor can see the page "Contact us" with the list of the main sections	Any visitor can see the page "Contact us" with the list of the main sections	The function works
6.	Register a new user in the database of the registration page	The user can insert his first name, last name, mobile number, e-mail, date of birth, username, and password to register	The user can insert his first name, last name, mobile number, e-mail, date of birth, username, and password to register	The function works
7.	Showing message with an error while registering a new user	If the user, while writing his username ,and password, enters name or password which are not registered in the database, the system shows the message with a mistake	If the user, while writing his username ,and password, enters name or password which are not registered in the database, the system shows the message with a mistake	The function works
8.	The system must show statistical reports the total number of books in each category	Any visitor can watch this page with total number of books in each category	Any visitor can watch this page with total number of books in each category	The function works
9.	The system must show the full catalog of books in the library	Any visitor can see this page	Any visitor can see this page	The function works
10.	The system must show all the books in the library	Any visitor can see this page	Any visitor can see this page	The function works
11.	Adding a request for a book	Any registering user can see the page "Adding book request "	Any registering user can see the page "Adding book request "	The function works

No.	Function	Expected result	Obtained result	Conclusion
12.	Make a search for specific book	Any visitor can see the bar search with in the list of main section	Any visitor can see the bar search with in the list of main section	The function works
13.	Make an advance search With specific parameter	Any visitor can see the page "advance search" with the list of the main sections	Any visitor can see the page "advance search" with the list of the main sections	The function works
14.	At the login page of the section "Admin" the user has the permission to insert his special username and password to validate his data and see the list of functions in the admin main page	The administrator can see the list of functions in the "Admin" page	The administrator can see the list of functions in the "Admin" page	The function works
15.	The admin must be able to modify information about users' accounts.	The administrator can see the page "Modify use " with the list of the main admin function	The administrator can see the page "Modify use " with the list of the main admin function	The function works
16.	The admin must be able to modify information about books exist in the library.	The administrator can see the page "Modify book " with the list of the main admin function	The administrator can see the page "Modify book " with the list of the main admin function	The function works
17.	The admin must be able to modify information about categories exist in the library.	The administrator can see the page "Modify category" with the list of the main admin function	The administrator can see the page "Modify category" with the list of the main admin function	The function works
18.	The admin must be able to add new books to the database	The administrator can see the page "Add book" with the list of the main admin function	The administrator can see the page " Add book " with the list of the main admin function	The function works

No.	Function	Expected result	Obtained result	Conclusion
19.	The admin must be able to add new categories to the database	The administrator can see the page "Add Category" with the list of the main admin function	The administrator can see the page " Add Category" with the list of the main admin function	The function works
20.	The admin must be able to add new user to the database	The administrator can see the page "Add user" with the list of the main admin function	The administrator can see the page " Add user" with the list of the main admin function	The function works
21.	The admin must be able to add new admin to the database	The administrator can see the page "Add admin" with the list of the main admin function	The administrator can see the page " Add admin" with the list of the main admin function	The function works
22.	The admin must be able to modify his account	The administrator can see the page "Modify admin" with the list of the main admin function	The administrator can see the page " Modify admin" with the list of the main admin function	The function works
23.	The admin must be able to register books to borrow for specific user.	The administrator can see the page "issue book" with the list of the main admin function	The administrator can see the page "issue book " with the list of the main admin function	The function works
24.	The admin must be able to register books to return for specific user.	The administrator can see the page "return book" with the list of the main admin function	The administrator can see the page "return book " with the list of the main admin function	The function works
25.	The admin must be able to see all borrowed books.	The administrator can see the page "issued book" with the list of the main admin function	The administrator can see the page "issued book " with the list of the main admin function	The function works

No.	Function	Expected result	Obtained result	Conclusion
26.	The admin must be able to see all returned books.	The administrator can see the page "returned book" with the list of the main admin function	The administrator can see the page "returned book" with the list of the main admin function	The function works
27.	The user must be able to check whether the book is available to borrow.	Any visitor can see this function with in the book availability section	Any visitor can see this function with in the book availability section	The function works
28.	The user can send a message through the "contact us" page	Any visitor can use this function by enter his email address with massage content	Any visitor can use this function by enter his email address with massage content	The function works
29.	Read the books online in the library	Any visitor can open and read the book	Any visitor can open and read the book	The function works
30.	The admin must be able to delete information about books exist in the library.	The administrator can see the page "Modify book " with the list of the main admin function	The administrator can see the page "Modify book " with the list of the main admin function	The function works
31.	The admin must be able to delete information about users exist in the library.	The administrator can see the page "Modify book " with the list of the main admin function	The administrator can see the page "Modify book " with the list of the main admin function	The function works
32.	The admin must be able to delete information about categories exist in the library.	The administrator can see the page "Modify book " with the list of the main admin function	The administrator can see the page "Modify book " with the list of the main admin function	The function works

4.2. Screen forms of the application

Any visitor can see the main page, the main page contains several functions ("Admin", "Dashboard", "Search", "login", "Contact Us", "Advance Search", "Create an account") as in the fig. 50.
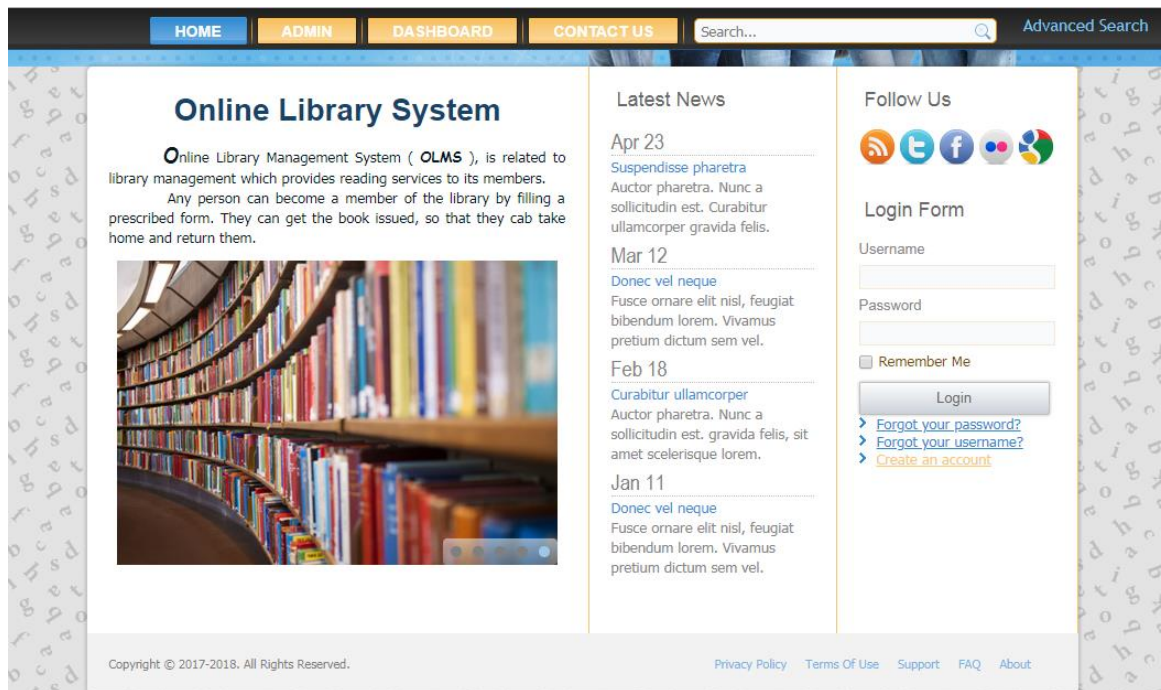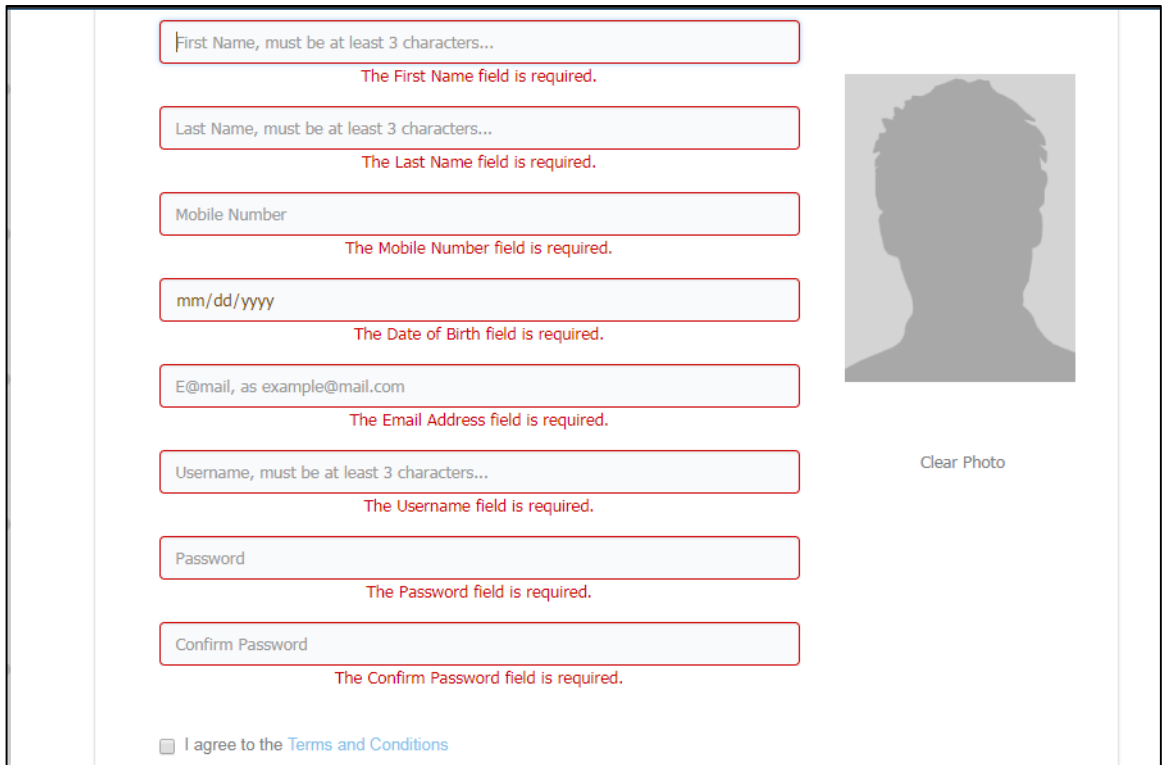
Fig. 50. The main page

The visitor to the main page can create new account by insert his information ("First Name", "Last Name", "Mobile Number", "Date of Birth", "Email address", "Username", "Password", "Upload Photo"). He can do that in the section "Create an account" in the login form which is shown in fig . 51.

Fig. 51. The page for the user register
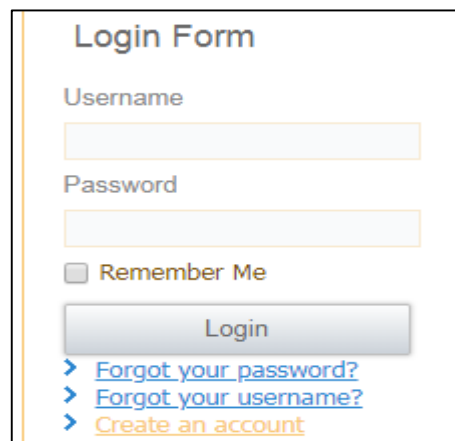
The user who did a mistake while he enter his special information in order to register the system will give the user message of his mistake as in the fig. 52.

Fig. 52. The page for the mistake user registering

"Login" in this section of the main page. Each users must enter his special username and password to login in the website as shown in the fig. 53.

Fig. 53. The page for user login

The user who did a mistake while he enter his special information in order to login in the system will give the user message of his mistake as in the fig. 54.

Fig. 54. The page for refusing user login

After login, each user gets the ability to modify his account, and to check the expire date for his borrowed books if he had one, as in the fig. 55-57.

Fig. 55. The page for login user

Fig. 56 show page for the user to check the borrowed book details.

No.	User Name	Book ID	Book Name	Author	Category	Borrow Date	Return Date	Status	Penalty
1	fadhil	A01002	The stones of Venice	John	Art	2018-04-22	2018-04-23	Returned	0 $
3	fadhil	M03001	The strange case of Dr. Jekyll and Mr. Hyde	Robert Louis	Mystery	2018-04-10	2018-05-04	Returned	14 $

Fig. 56. The page for the user to check the borrowed book

Fig. 57 show page for user to change his account details.

Fig. 57. The page for modify user account

"Recovering" is this section of the login form in the main page. Each users can recover his password or username at any time using his special email address and he will receive on his email the requested information, as in the fig. 58-59.

Fig. 58. The page for recovering of a password

Fig. 59 shows page for recovering of a user name.
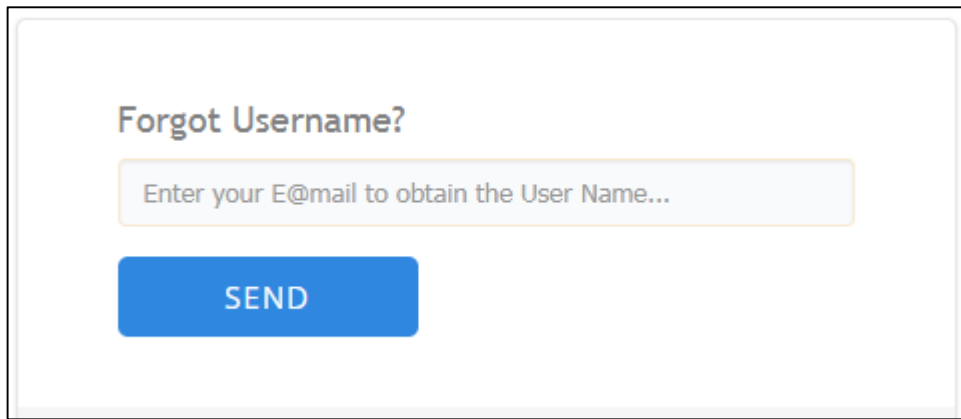
Fig. 59. The page for recovering of a user name

"Administrator" is this section of the main page. The administrator can enter his special username and password, as in the fig. 60. His special main page views as shown in the fig. 61.
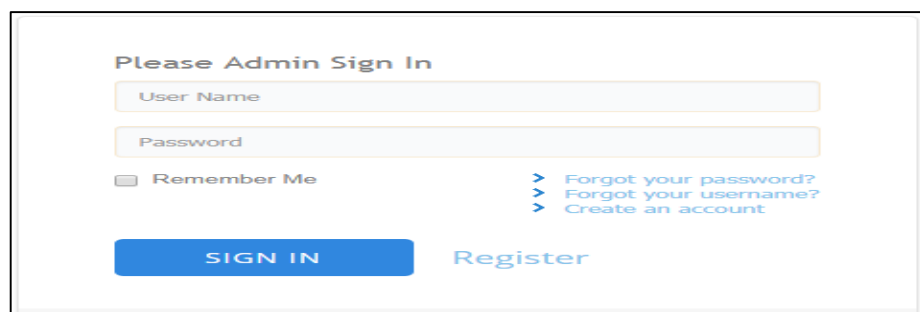
Fig. 60. The page for Admin login

Fig. 61 shows page for Administrator with the control features to manage the library.
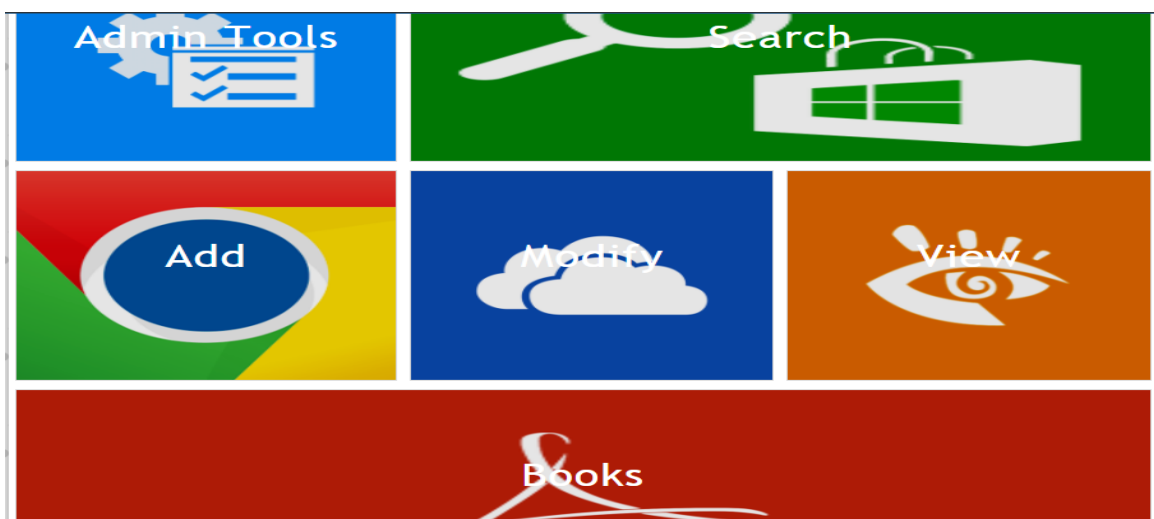
Fig. 61. The main page for "Administrator"

"Admin Tools" this button in the administrator main page, which is devoted to modify staff account and added new staff as in the fig. 62.

Fig. 62. The page for Adding new Admin

"Search" is the button in the administrator main page, which search for specific users, books, and category, and shows the result to the admin, as in the fig. 63.

No.	Book ID	Book Name	Author	Year	Category	Book Type	Book Availability
2	C01001	Alice Abenteuer im Wunderland	Lewis Carroll	1933	Children	Hard Copy	Available
3	C02001	Common sense in the household	Harland	1884	Cooking	Both Copy	Available
4	C02002	Dr. Chase recipes	Alvin Wood	1878	Cooking	Soft Copy	Available
5	B01001	Far away and long ago	William Henry	1918	Biographies	Hard Copy	Available
6	M01001	First lines of the practice of physic	William Cullen	1883	Medicine	Both Copy	Available
7	B01002	John Barleycorn Illustrated	Jack	1913	Biographies	Soft Copy	Available
8	H01002	Julius Caesar	Shakespeare	1908	History	Hard Copy	Available
10	M02001	Nachgelassene Schriften und Dichtungen	Richard	1902	Music	Soft Copy	Available
11	E01002	The advancement of learning	Francis	1965	Engineer	Hard Copy	Available

Fig. 63. The page for Books Search

"Add" this button in the administrator main page, devoted to inter all information about adding new users, categories, And books to the library as in the fig. 64-66.

Fig. 64. The page for Adding new Book

Fig. 65 show the page for Adding new Category to the library.

Fig. 65. The page for Adding new Category

Fig. 66 show the page for Adding new user to the library.

Fig. 66. The page for Adding new user

"Modify" is the button in the administrator main page devoted to make change and delete all information about the users, categories, And books in the library shown as in the fig. 67.

Fig. 67. The page for Modify Category

"Books" is the button in the administrator main page devoted to register books to borrow or return by a specific user also to check the details and expire date of the books that already borrowed or returned, And books as in the fig. 68-70.

Fig. 68. The page for Register borrow book

Fig. 69. Show the page for register return book.

Fig. 69. The page for Register return book

Fig. 70 show page for check the Expire date for the borrowed book.

No.	User Name	Book ID	Book Name	Author	Category	Borrow Date	Return Date	Status	Penalty
1	fadhil	A01002	The stones of Venice	John	Art	2018-04-22	2018-04-23	Returned	0 $
3	fadhil	M03001	The strange case of Dr. Jekyll and Mr. Hyde	Robert Louis	Mystery	2018-04-10	2018-04-20	Borrowed	

Fig. 70. The page for check the Expire date

"Dashboard. The visitor to this page can see the different categories and books in the library also can browse by all the categories or books and by clicking on specific book can see the details of the book also read the book online in the website. Also for register user the ability to add a request on the book, as shown in fig. 71-75.
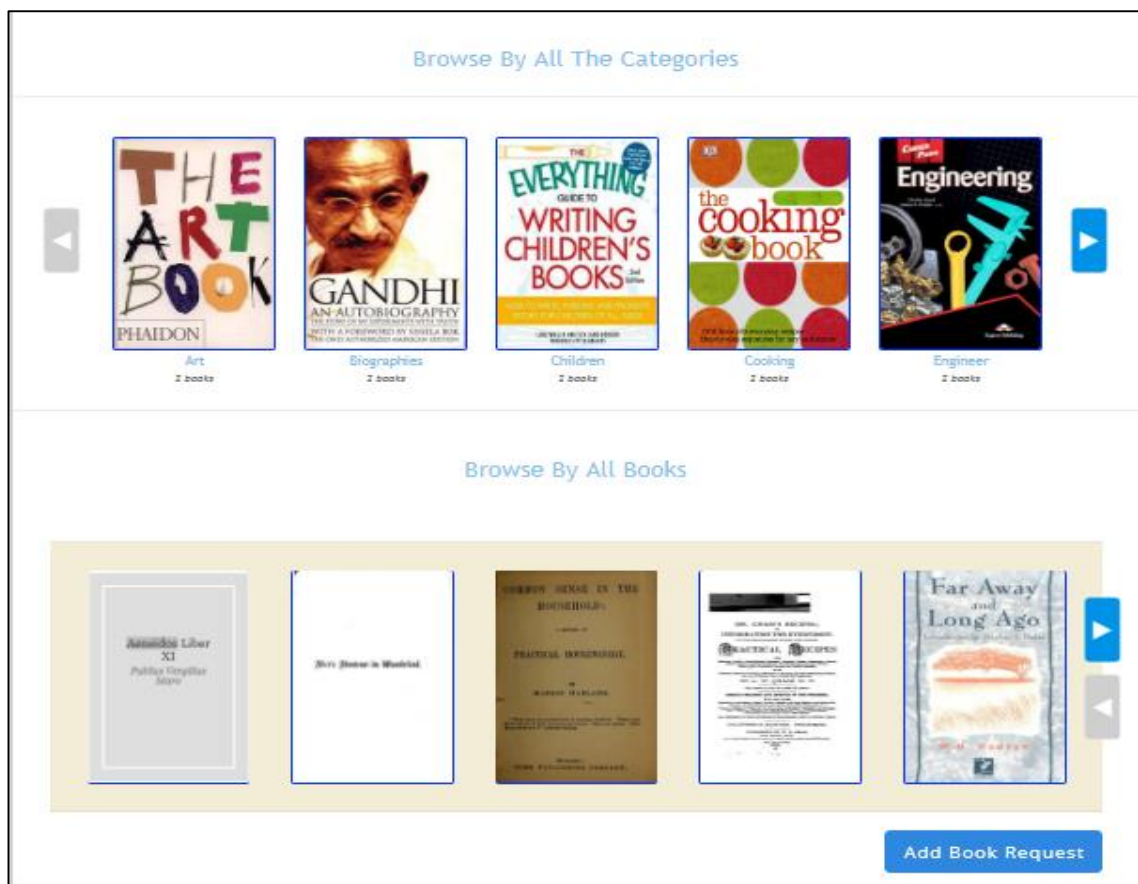

Fig. 71. The page for the Dashboard

Fig. 72 shows page for the Browse By All Categories in the library.
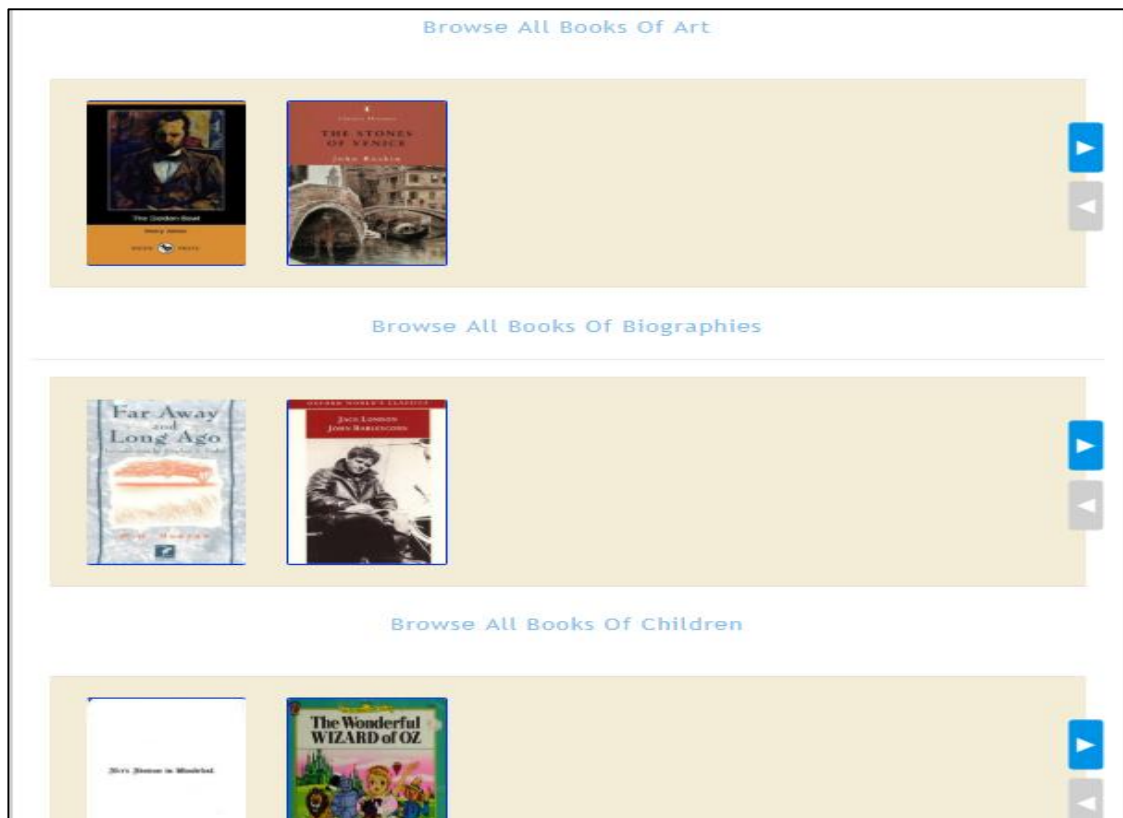
Fig. 72. The page for the Browse By All Categories

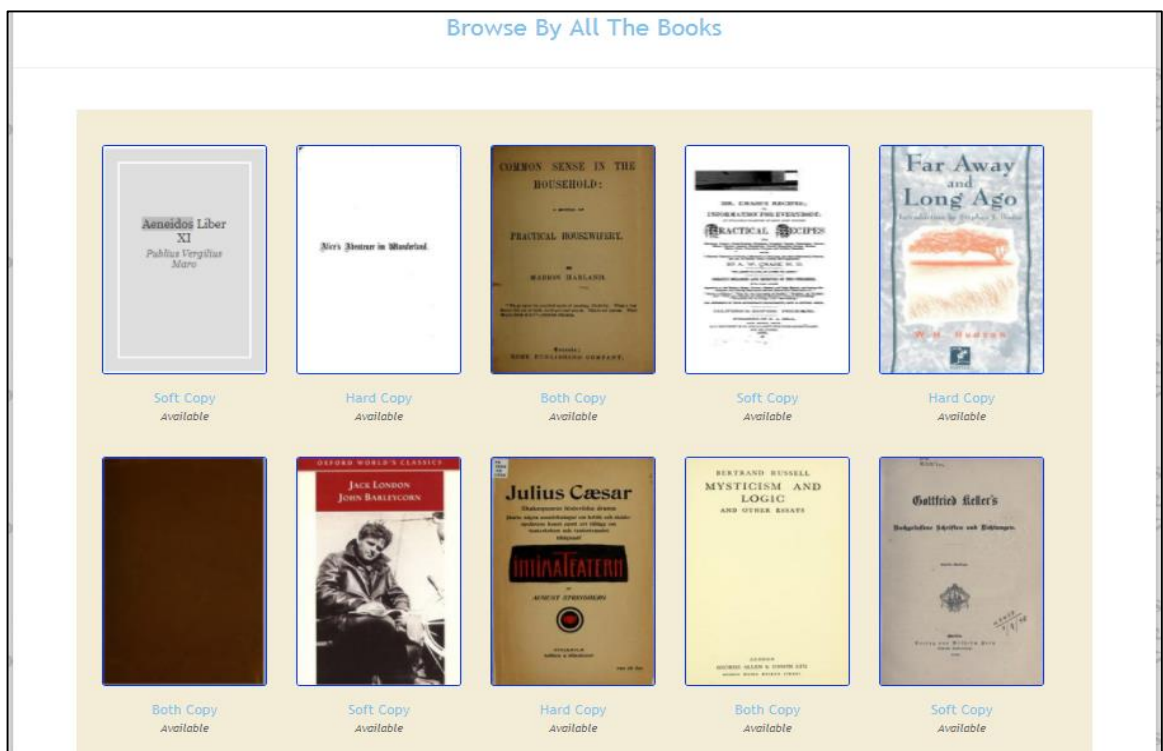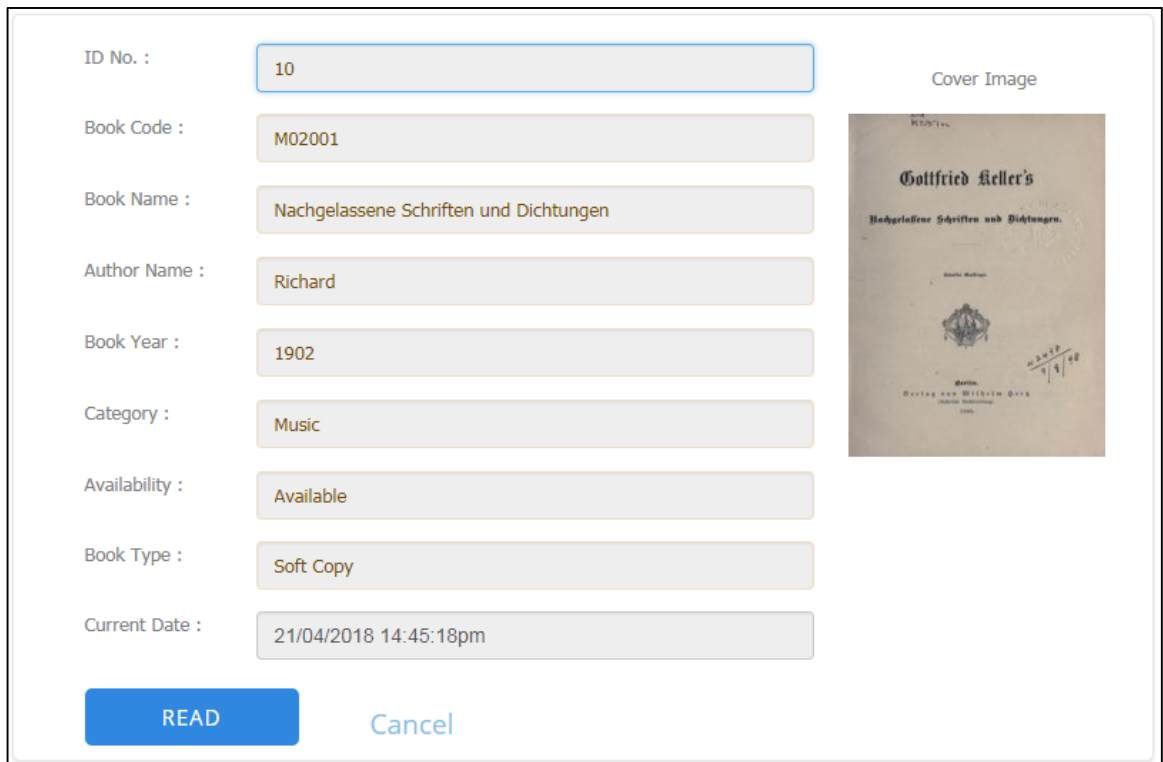Fig. 73 shows page for the Browse By All Books in the library.

Fig. 73. The page for the Browse By All Books

Fig. 74 show page for the details of specific book in the library with the ability to online read.
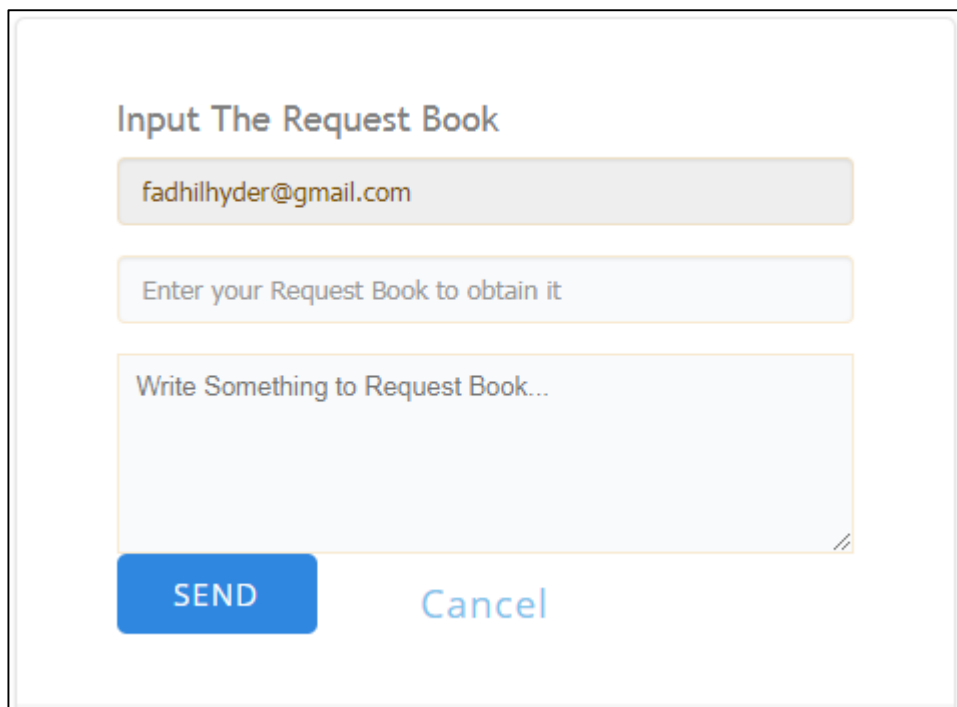
Fig. 74. The page for the details of specific book

Fig. 75 shows page for adding book request for register user.

Fig. 75. The page for adding a book request

"Contact us". The visitor to this page enter can enter his email address with any request or issue as shown in the fig. 76.

Fig. 76. The page for the Contact Us

"Advanced Search". The visitor to this page can search for a specific book by enter (Author name, Book name, Category, and publish year) of the book or use the search bar in the upper side for simple search, as shown in the fig. 77.

Fig. 77. The page for the Advance Search

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CONCLUSION

There are many reasons why one might want digital libraries. They might make research easier for scholars. They might ease the budget pressures on libraries. They might solve our increasingly urgent preservation problems, or they might help libraries extend collections into new media. However, perhaps their most important advantage would be their ability to help society, to make information more available, raise its quality, and increase its diversity. This will depend on how we fund, regulate, and manage digital libraries, the new communications infrastructure and the new technologies that drive them.

Digital libraries offer new and improved services, and to deal with a cost crisis now affecting their current services. Dreams of computer-based libraries, which have been around for decades, are now practical. There are libraries, which already spend more than half their acquisitions budget on electronic resources, rather than paper. Meanwhile, many university libraries are finding it impossible to maintain their traditional collecting practices within the constraints of their institutional budgets. They look eagerly to the new technology as a solution.

Thus, libraries are faced with two simultaneous problems: their inability to buy enough new materials, and their inability to keep enough old materials. Electronics can, in principle, be an answer to both.

In addition, electronics can offer many advantages to libraries. These include both better access to traditional materials, easier preservation, and extension of library collections.

As many have discovered, the ability to search provides an enormous advantage to electronic materials.

Electronics also provides several other advantages. a single electronic copy can be accessed from a great many locations, and to many simultaneous users (assuming copyright permission is available). Copies can be delivered with electronic speed, and it may be possible to reformat the material to the convenience of the reader (e.g. in larger type size for those with limited sight, or in order to fit

a smaller screen). Since readers get a screen display of the object, rather than carrying away the physical object, loss rates by theft may be much reduced [21].

Therefore, during the developing of the web application, we solved the following tasks:

1) the modern tools of web sites developing and make the comparative analysis of the content management systems for web-development are studied;

2) the analogical library management systems with web-interface and declare their peculiarities, advantages and disadvantages are studied;

3) the structure of the required database for library management system are developed;

4) the web-application were designed;

5) the mathematical model of penalty calculations for the library management system are described;

6) implemented the library management system with a web-interface;

7) the system were tested.

So, the main functions of the developed library managements systems are the following:

1) capability to issue (borrow) and register returned books;

2) the administrator has an account to manage the library database;

3) the capability to search availability of books;

4) the user can check his issued books;

5) store all the books and user data in a proper manner and up to date.

The perspectives for the developed application. Always we can think out some function, which we can implement in future:

1) to develop the advance searching tool to give the user the ability to search for specific book by enter more than one parameter at a time;

2) to make the function for adding a book request by the user more advanced by checking user input directly and give him a feedback if the book already exists in the library;

3) the system must send SMS or email remanding for user who must return the borrowed book before missing the return date;

4) to add online pay card so the user can pay his invoice for:

a) dallying returned the borrow book;

b) buying books from the library;

5) to add a rating and comment line so each user can share his opinion on the book.

REFERENCE LIST

1. Bagdad University Official site of General Secretary of the Center Library. [Electronic Resource] URL: http://www.clib.uobaghdad.edu.iq/(the date of access: 26.10.2017).

2. Bell D. IBM developer Works. [Electronic Resource] URL: http://www.ibm.com/developerworks/rational/library/769.html (the date of access: 10.05.2018).

3. Component Diagram For Library Management System by NIRAJ AHER. [Electronic Resource] URL: http://www.javaengineeringprograms.com/component-diagram-for-library-management-system/ (the date of access: 05.04.2018).

4. Delisle M. Creating your MySQL Database: Practical Design Tips and Techniques. – UK: Packt Publishing Ltd, 2006. – 105 p.

5. Engineering Projects – Library Management System. [Electronic Resource] URL: http://www.muengineers.in/computer-project-list/java-projects-list/library-management-system (the date of access: 28.04.2018).

6. Gerrard P. A unified approach to system functional testing. // Euro-STAR, 25–28 October, 1993. – P. 36/1-36/9.

7. International Nuclear Information System (INIS) & IAEA Library. [Electronic Resource] URL: https://www.iaea.org/inis/products-services/newsletter/INIS-Newsletter-2013-14/2013-14-07/index.html (the date of access: 28.04.2018).

8. IsadoraDuncan Answers.com. [Electronic Resource] URL: http://www.answers.com/Q/Why_is_the_internet_so_popular (the date of access: 28.04.2018).

9. Librarians in Independent prep schools in South East England LIPSSEE. [Electronic Resource] URL: https://preplibs.wordpress.com/library-management-systems/ (the date of access: 28.04.2018).

10. Library Automation. [Electronic Resource] URL: https://www.ency-clopedia.com/media/encyclopedias-almanacs-transcripts-and-maps/library-auto-mation (the date of access: 28.04.2018).

11. Official site of Alexandria Library. [Electronic :resource] URL: https://www.bibalex.org/ar/default (date of access: 26.10.2017).

12. Official site of Iraq Virtual Science Library-IVSL. [Electronic :re-source] URL: https://www.ivsl.org/ (date of access: 26.10.2017).

13. Official site of MySQL Server. [Electronic Resource] URL: http://dev.mysql.com/doc/refman/4.1/en/what-is-mysql.html (the date of access: 25.10.2017).

14. Official site of Qatar University Library. [Electronic resource] URL: https://library.qu.edu.qa/en/#.WfnCPtWWbIU (date of access: 26.10.2017).

15. phpMyAdmin. [Electronic Resource] URL: www.phpmyadmin.net (the date of access: 10.05.2018).

16. Sodiya A.S. User interface design and ergonomics. – Nigeria: National Open University of Nigeria, 2009. – 200 p.

17. The official Joomla website. [Electronic Resource] URL: https://www.joomla.org/ (the date of access: 28.10.2018).

18. The official Wordpress website. [Electronic Resource] URL: https://wordpress.com/about/ (the date of access: 28.10.2018).

19. Top 3 CMS comparison. [Electronic Resource] URL: https://www.sktthemes.net/fyi/cms-comparison-wordpress-joomla-drupal/ (the date of access: 28.10.2017).

20. Tutorials point.[Electronic Resource] URL: https://www.tutori-alspoint.com/php/php_introduction.htm (the date of access: 10.05.2018).

21. Why digital library by Michael Lesk Bellcore. [Electronic Resource] URL: http://lesk.com/mlesk/follett/follett.html (the date of access: 28.04.2018).

22. WordPress vs. Joomla vs. Drupal. [Electronic Resource] URL: https://websitesetup.org/cms-comparison-wordpress-vs-joomla-drupal/ (the date of access: 28.01.2018).